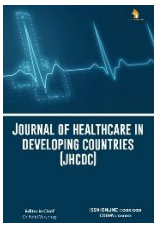
ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2785-8391 (Online)
CODEN: JHDCAZ

Journal of Healthcare in Developing Countries (JHCDC)

DOI: http://doi.org/10.26480/jhcdc.01.2023.15.18



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RESEARCH ARTICLE

GIS APPLICATION ON HEALTH SERVICES FOR MALARIA DETECTION IN NASARAWA STATE, A CASE STUDY OF KEFFI

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ARTICLE DETAILS

Article History:

Received 25 November 2022
Revised 10 December 2022
Accepted 12 January 2023
Available online 14 January 2023

ABSTRACT

GIS technology has advanced in the area human health and comfort for the stable development in our society. The issue of malaria outbreak and lack of proper hygiene was alarming in most developing countries of Africa and South East Asia. In this study, data of out-patients were collected and analysed using new method of cloud-GIS which is also function like web GIS. The recent development in most hospitals is the creation of patients' database for easy service delivery. Everything now is turning to be electronically synchronised for quick attention and time saving. The introduction of cloud Geographic Information System, patient's lives were improved and saved. Once the information of the patient is recorded, then it speeds up the health delivery of necessary diagnoses to be administered. The objectives of the study are to evaluate the spread of the malaria disease and to examine the spatial and non spatial attributes of the patients in Keffi Local Government Area of Nasarawa State, Nigeria. The results indicated that about 12 districts were geocoded using 2 years data from 2020 to 2021. In 2020 about 1,145 people were contracted with Malaria in Keffi with the highest record geocoded is Anguwan Tive in July and Sabon Layi in June 2020. While, the lowest malaria cases was reported in Antau and GRA area. In 2021 the total people attacked by malaria is 1,108. This reported little improvement and reduction of malaria from the previous year in Keffi.

KEYWORDS

GIS, Database, Geo-code, Malaria, Patients

1. INTRODUCTION

In the field of medicine, GIS technology has had a significant impact. Advancements can either make many patients' lives longer or make them more comfortable. One of the most intriguing technologies to emerge recently is one designed to address geographical links to diseases more effectively: Geographic information systems are a sophisticated kind of mapping software that lets people see how input data for a specific project looks. Users can see geographic groupings of demographic data about patients in a new way when data is displayed visually. The information gathered during an active case detection survey in Keffi, Nasarawa State, was used to create GIS maps. Out-patient card records and rapid diagnostic tests (RDTs) were used in the survey. The study area's localities influenced the samples' differences. The majority of patients present with malaria symptoms and are routinely diagnosed (Franco-Herrera et al., 2018).

As a technology and a set of tools for manipulating and displaying spatial data, Geographical Information Systems (GIS) are now well-established in a growing number of applications.GIS, on the other hand, have primarily been utilized in the fields of environmental analysis and resource management, particularly in Australia (Pinheirob et al., 1993). The management of human resources and facilities, also known as applications of GIS in urban and regional analysis, has generally lagged behind. However, applications in these fields are just beginning to emerge, and in recent years, the technology has spread to a wide range of application fields that are typically referred to as the "services" sector (such as real estate, transportation, retail, banking, and finance, and others).However, the provision of health and welfare services is one of the most crucial service areas that has not yet been addressed to the same degree. As the significant potential of GIS is becoming increasingly recognized in the management of health data, mapping health indicators and disease incidence, the analysis of patterns and distributions, facility location, and studies of access and health delivery, signs are now evident that this is also beginning to change (Khalfaoui and Hammouche, 2019).

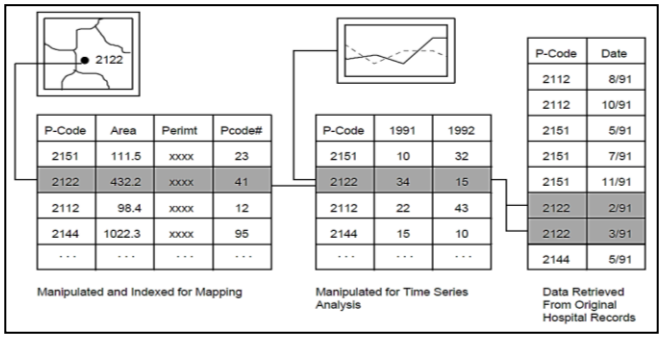

Figure 1: Integrated database System for spatial and Non-Spatial data (GIS Data)

2. THE MALARIA EPIDEMIC IN NIGERIA

In spite of the progress that has been made in eliminating malaria over the past century, there is still a great deal of work to be done. In Nigeria, malaria mortality rates have decreased by 50% over the past two decades. Throughout the world, there have been dozens of re-emergences of malaria. The lack of funding for malaria projects and careless attitudes, as

Quick Response Code	Access this article online	
	Website: www.jhcdc.com.my	**DOI:** 10.26480/jhcdc.01.2023.15.18

Cite The Article: Sufiyan I, I.M Sagir, B.L Nasir (2023). Gis Application on Health Services for Malaria Detection in Nasarawa State, A Case Study of Keffi. *Journal of Healthcare in Developing Countries, 3(1): 15-18.*

well as poor sanitation and hygiene, are directly responsible for many of these cases. Given that Nigeria and the Democratic Republic of the Congo account for 30% of malaria deaths, their efforts may contribute significantly to the global effort to eradicate malaria. The use of geographic information systems (GIS) technology as a tool for resolving global health issues, such as the malaria pandemic, is a fantastic and welcome concept that gathers a lot of data to address issues related to human health (Yang, 2009). A crucial intervention in the fight against malaria is insecticide-treated nets (ITNs).Although 100% coverage is ideal, actual intervention coverage varies due to geographic accessibility to the targeted areas and financial and human resource constraints. We must ensure the following when implementing the intervention:

1) Individuals own enough Insect Treated net (ITNs) for the entire family; 2) They sleep under ITNs every night; and 3) They regularly re-treat ITNs. The health outcome of malaria is also influenced by adherence to the intervention, or the proper use of ITNs, in addition to the availability of ITNs. Through people group wellbeing instruction, individuals find out about the reason for jungle fever and the legitimate utilization of ITNs, and are urged to visit the wellbeing office for appropriate determination and treatment instead of self-treatment (Ononamadu et al., 2020).

2.1 Objectives of the Study

This study is aim at find out the details of two (2) major killer diseases in Nigeria that is Malaria and Cholera with the objectives as follows, to:

1. evaluate the spread of the Malaria and Cholera
2. Assess the period to which the diseases prevails
3. Examine the spatial and non spatial attribute using GIS

2.2 Impact of GIS Technology in Health Sector

2.2.1 Identifying Health Trends

Healthcare professionals can use the software to identify health-related trends and better target their healing efforts based on those results. The Cancer Surveillance Program at the University of Southern California is just one example of how this is put into practice. The Public Health Program there uses geographic information systems in a variety of its projects. The program evaluates the demographic information of all patients who are entered into the system, including their home address, workplace, cancer type, and even information gathered from wearable health technology. Information is then georeferenced and planned. Patients' locations can be visualized by medical professionals, who can then ascertain whether clusters of particular types of cancer are associated with similar working conditions or residential areas. As the number of chronic illnesses like diabetes, heart disease, and cancer rises. GIS may offer a means by which healthcare professionals can systematically address areas where particular diseases are more likely to occur or have already occurred and begin proactively implementing preventative measures or staffing skilled healthcare professionals' in particular medical specialties.

2.2.2 Tracking the Spread of Infectious Disease

Monitoring the Expansion of Infectious Diseases The function of GIS systems ought not to be restricted to simply monitoring the occurrence of infectious diseases. Its ability to use geography and other inputs to determine where diseases are most likely to spread next is one of its most powerful features. Because it enables them to prepare in advance for a disease and can severely limit its impact, data like this can be crucial to personnel working on the ground to save lives. These maps are beginning to play a significant role in the management of Ebola and measles outbreaks. GIS-based maps, for instance, were created during the Disneyland measles outbreak in December 2014 to help visualize the locations of infected children and the potential for the disease to spread. Additionally, it was used to gain a deeper comprehension of vaccination rates and laws in various counties across the United States to determine which areas might be most severely affected by a serious outbreak (Eperon et al., 2017).

2.2.3 Utilizing Personal Information

Using Personal Technology, The collection of a lot of precise personal data is expected to reveal a lot about personalized healthcare, but it can also have a big impact on treatment plans for the whole region. Because they can help statistical studies, personal healthcare technologies are a powerful tool for putting information into GIS. It has the potential to reveal long-term trends in the health of demographics or individuals living in particular parts of the United States. The average heart rate, sleeping patterns, and sun exposure are just some of the health-related data that can be gathered using GIS technology. By incorporating this data into a GIS, it may be possible to ascertain whether individuals' average heart rates or sleeping patterns vary across geographical areas. Finding the reasons behind such patterns, if they do exist, could open up new areas of healthcare research (Franco-Herrera et al., 2018).

2.2.4 Incorporating Social Media

Social media can also play a significant role, just like wearable technology can be used to collect input data. For instance, during the flu seasons of 2012 and 2013, researchers searched Twitter for tweets that suggested illness. They used terms like "flu," "influenza," and "medication," as well as the location from which the tweet was sent. Researchers were able to see the status of the flu in the United States for that year by incorporating this data into a GIS map. The goal of future research and data collection is to anticipate where the flu will have the greatest impact (Pinheirob et al., 1993).

2.2.5 Improving Services

Community leaders and developers may be able to collaborate more closely with hospitals in order to take larger steps toward addressing national healthcare requirements through the utilization of GIS technology. The system can assist in determining which neighbourhoods have a greater demand for particular health services like more rehabilitation centres or senior care facilities. These questions can be answered by analyzing demographic data about patients. Technological advancements are linked to medical advancements. Additionally, earth surfaces and medical research are connected. The protection of human existence is shared by both. We can all agree that a geographic information system is a significant tool with numerous health sciences applications. Health is a multidisciplinary endeavour that can be accomplished effectively. Additionally, the tool aids in decision-making and thus contributes to the development of policies.GIS is used for the following things.

2.2.6 Application of GIS in Health Sciences

Sciences additionally, earth surfaces and medical researches are connected. The protection of human existence is shared by both. We can all agree that a geographic information system is a significant tool with numerous health sciences applications. Health is a multidisciplinary endeavour that can be accomplished effectively. Additionally, the tool aids in decision-making and thus contributes to the development of policies. GIS is used for the following things.

2.2.7 Effective and Fast Decision Making

Quick and efficient decision-making The health industry is a contentious and complicated field. It is necessary for professionals to comprehend health-related factors. Through the use of software and a number of information technology services, health workers' work is now more efficient. The health sector faces numerous difficulties. In 1854, Dr. Snow designed planning in wellbeing research. However, this is insufficient to prompt a decision. According to Forte et al., health workers can now arrive at more conclusions more quickly thanks to the geographic information system.

2.2.8 Prediction

The tool is essential for prediction in addition to supporting the decision-making process by providing information. GIS is used in many health-related studies. Additionally, these systems are ideal for simulation and prediction models. GIS is used to display studies that are based on hepatitis C and intravenous drug use.

2.2.9 Analyze Diseases

There are a variety of tools for displaying or evaluating epidemiological data, one of which is GIS. The management of surveillance and the analysis of diseases rely heavily on geographic information systems. Both imaging and conventional processing methods make it impossible to comprehend data. Public services and other health issues can be displayed on the map with GIS. Additionally, it can be correlated with a variety of data, including information on social issues, health concerns, and the environment.

2.2.10 Manage Health Programs and Diseases

Manage diseases and health programs GIS has developed methods for managing and monitoring both health programs and diseases. Understanding, emphasizing, and keeping an eye on the causes of certain diseases is critical. Environment, behaviour, and socioeconomic factors are among these. When it comes to assessing risks that affect people, GIS is an excellent tool. The tool effectively identifies and investigates pandemic outbreaks

2.2.11 Access Mental Health Services

Get access to mental health services mental disorders are a widespread disease that affects people all over the world. It is a disease that has resulted in numerous impairments. To treat and prevent mental disorders, mental data must be geographically represented. Access to mental health and general health services is made easier with GIS.

2.2.10 Manage Environmental Health

It is essential to ascertain the human impact of the environment. Worldwide diseases like stroke and heart disease are increasingly caused by environmental hazards. Checking information about pollutants can be done with GIS.

2.2.11 Map Diseases

Disease is the leading cause of death.GIS is useful for mapping diseases and assisting professionals in developing effective preventative measures.

2.2.12 Investigating Epidemics

Examining epidemics Worldwide, cholera, typhoid, and bilharzias are epidemics. A lot of people are affected by these diseases that spread through water. The purpose of the tool is to check for epidemics.

2.2.13 Provide Distribution Information

Provide data on distribution GIS provides data on the distribution of health services. Disparities that are getting worse can now be fixed.

2.2.14 Planning

Planning the tool is essential for health and social care planning. Now, public issues can be effectively resolved

3. METHODOLOGY

This study evaluates the spread of malaria and cholera in the study area using the technology of a Geographic Information System. During the 2014 Ebola outbreak in Africa, Médecins Sans Frontières (MSF) International utilized GIS. Additionally, health officers can now efficiently collect field data by utilizing GIS Cloud tools. In the malaria case, GIS gives us a platform that lets us combine various thematic layers, create visualizations, and run predictive model algorithms to help create a health community that is well-informed.

3.1 Study Area

Areas with malaria cases, lower intervention coverage, and lower adherence were identified, as shown by the GIS maps. Although the majority of villages with the best access to the district centre did not have a malaria case, several cases were found in the distant villages, where intervention coverage and adherence remained relatively low.

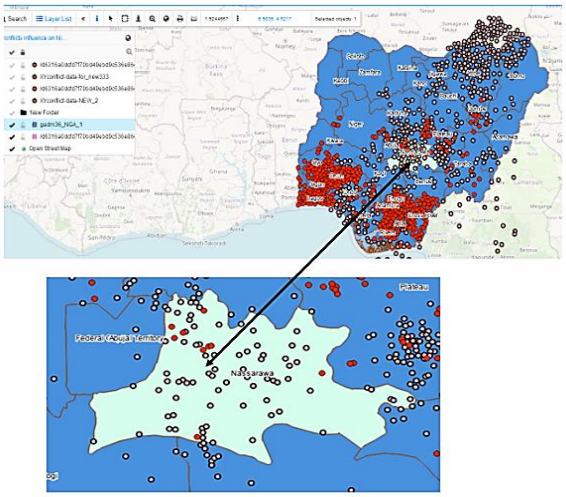

Figure 2: The Study area map showing the Malaria affected zones in Keffi, Nasarawa State Nigeria

3.2 Data Presentation

The data from this study was obtained from the Nigeria Centre for Disease Control GIS on Health Cholera Situation Report Monthly Epidemiological Report.

3. RESULTS AND DISCUSSION

Table 1: Presents Number of Malaria Patients and their Geocoded Areas in 2020

2020	No of Patients contracted	Geocode
January	80	Kofar Tasha
February	85	Kasuwa
March	105	Tudu
April	115	Masaka
May	110	Karofi
June	125	Sabon Layi
July	135	Anguwan Tivi
August	112	Liman Abaji
September	90	Unguwan Nepa
October	75	Moddibo Street
November	60	GRA
December	53	Antau

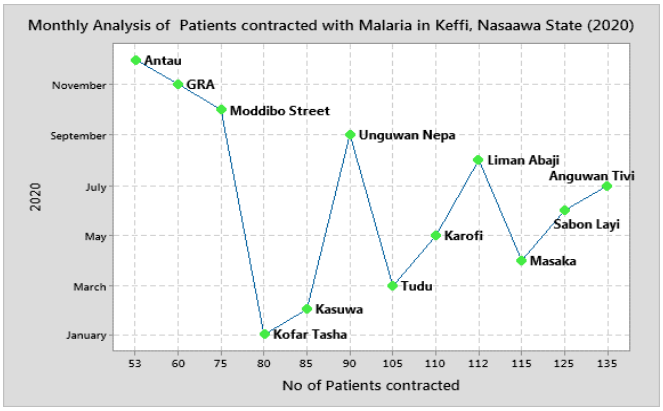

Figure 3: The Graphical Spatial data presentation of Malaria in 2020

Table 2: Presents Number of Malaria Patients and their Geocoded Areas in 2021

2021	No of Patients Contracted	Geocode
January	74	Kofar Hausa
February	78	Kasuwa
March	95	Tudu Kofa
April	110	Gangaran Masaka
May	120	Karofi
June	130	Sabon Layi
July	145	Anguwan Tivi
August	100	Liman Abaji
September	80	Unguwan Nepa
October	70	Moddibo Street
November	65	GRA
December	41	Antau

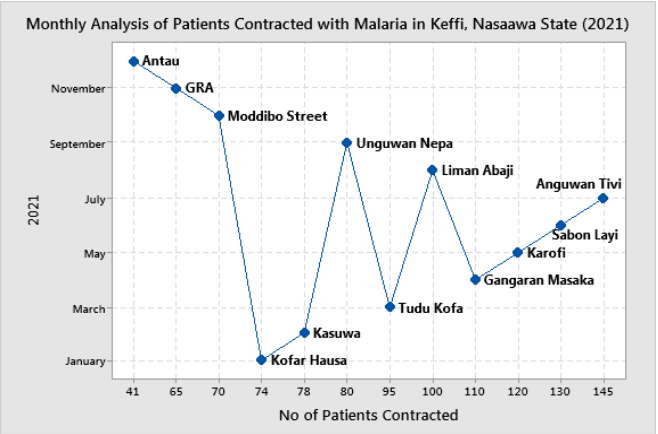

Figure 4: The Graphical Spatial data presentation of Malaria in 2021

4. Conclusion

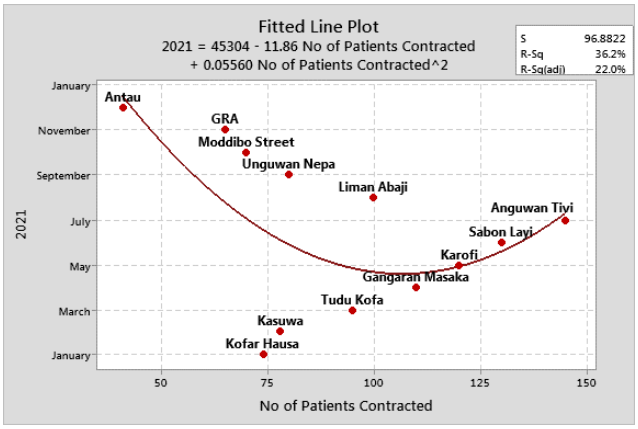

Figure 5: Fitted graph showing the Regression analysis of low, medium and High Malaria infection in Keffi, Nasarawa State, Nigeria

GIS mapping allows visualization of field survey results and provides essential information in targeting limited financial and human resources for the control of malaria within the province. The user-friendly GIS mapping method demonstrated in this study is a practical and feasible method for field researchers and health staff monitoring malaria risk in a geographically diverse area. The developed maps indicate the uneven distribution of intervention coverage and health outcome within the study area. Furthermore, reduction of malaria risk, balancing the intervention coverage in the overall coverage and continued promotion of the proper use of ITNs are necessary. Proper training and massive public enlightenment must be considered including sanitation and hygiene to eradicate the killer diseases in Nigeria. The monthly reports have visualized, and geocoded areas prompted with the Malaria parasite in Keffi, Nasarawa State Nigeria.The Regression line has equated and plotted the graph from Quadratic line as shown in Figure 5. list contraction of in December at Antau (41pateints), medium contraction in May at Karofi (120 Patients), and the highest contraction in July at Anguwan Tivi (145 Patients).

References

Eperon, G., Durieux-Paillard, S., Mauris, A., Chappuis, F., and Gysin, N., 2017. Malaria cases in Switzerland from 2005 to 2015 and recent rise of imported Plasmodium vivax malaria. Swiss Medical Weekly, 147, Pp. 4142.

Forte, F., Pennetta, L., and Strobl, R.O., 2005. Historic records and GIS applications for flood risk analysis in the Salento peninsula (southern Italy). Natural Hazards and Earth System Science, 5 (6), Pp. 833–844.

Franco-Herrera, D., González-Ocampo, D., Restrepo-Montoya, V., Gómez-Guevara, J.E., Alvear-Villacorte, N., and Rodíguez-Morales, A.J., 2018. Relationship between malaria epidemiology and the human development index in Colombia and Latin America. Le Infezioni in Medicina, 26 (3), Pp. 255–262.

Khalfaoui, I., and Hammouche, A., 2019. GIS Based Integration of the Health Emergency Services Regional Network in Morocco. International Journal of Machine Learning and Computing, 9 (4).

Ononamadu, C.J., Datit, J.T., and Imam, A.A., 2020. Insecticide Resistance Profile of Anopheles gambiae Mosquitoes: A Study of a Residential and Industrial Breeding Sites in Kano Metropolis, Nigeria. Environmental Health Insights, 14, Pp. 1178630219897272.

Pinheirob, V.E., Thaithongc, S., and Browna, K.N., 1993. High sensitivity of detection of human malaria parasites by the use of nested polymerase chain reaction. Molecular and Biochemical Parasitology, 61, Pp. 315–320.