

SPATIAL DISTRIBUTION PATTERN AND FACTORS AFFECTING IMMUNIZATION IN GOMBE LOCAL GOVERNMENT AREA OF GOMBE STATE, NIGERIA

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Abstract

The research provides empirical information on the spatial pattern and factors affecting immunization in Gombe Local Government Area of Gombe state, Nigeria. It was a cross-sectional study of children aged 0-23 months of eleven political wards of Gombe L.G.A. Thus Spatial Distribution of Immunization Centers, Demographic and Socioeconomic Characteristics affecting Immunization services, as well as Government role on immunization were observed. Four hundred mothers/caregivers were randomly interviewed and systematic sampling technique was used to obtain streets and housing samples. Inferential statistics, descriptive statistics, and qualitative (content analysis) were used in the data analysis. The result shows that on the basis of spatial analysis, Bajoga, Pantami, Nasarawo, Jekadafari and Herwagana experiences more immunization uptake as against Ajiya, Dawaki, Kumbiya-Kumbiya and the rest. Hence, there is hierarchy in terms of immunization compliance due to the differences of patronage at the immunization centers. demographic and socio-economic characteristics shows that most of the respondents are educated (77%) and fall between the ages of 15-30 Hausa/Fulanis (67%) with high and middle income earning (85%) and almost all of them believe in Islamic religion (96%) trader as occupation (96%), also fund and equipments for immunization services are majorly been contributed by partners like World Health Organization (WHO), United Nations Children Fund (UNICEF) and so on, but Government plays a vital role in dealing with provision of man-power, staff trainings etc. The study recommends that: additional health care facilities should be constructed around some areas of the political wards for effective immunizations service delivery to avoid congestion and waste of time to the mothers/caregivers. Government should also encourage formal education to higher levels as it is one of the factors that influences immunization uptake, Government should employ additional manpower for efficient and easy immunization services, easy networking systems should be provided for easy report of monthly, quarterly or annual immunization status to the Federal Capital Territory Abuja.

Keywords: Distribution, Factors, Immunization, Pattern Spatial, Gombe.

Introduction

Children health and, more importantly, the rates of neonatal and under-5 mortality are significant indicators of measuring level of development across countries and continents globally (Oyefara, 2014). Children are the future of any country, so their development is as significant as the development of other assets. Immunization is a vital part for the proper development of the children, it plays a fundamental role in the children's lives as a protective health action because it protects them from most dangerous childhood diseases, its process will become more successful

if the child receives all the required doses (Sourabh, 2016). Over two million deaths of infants below five years are averted through immunization every year (Tilottama and Madulekha, 2013). According to World Health Organization (WHO, 2010), an estimated 18.7 million infants globally are still missing out on essential vaccines. In research from some parts of Africa by Mihigo (2017), vaccine preventable diseases is still a root of childhood mortality, estimated at three million death every year (Ibnouf, Van den Borne and Maarse, 2014).

Immunization is the administration of antigen in the form of a vaccine, to produce an immune response to the body so as to protect it against future exposure to illness (Medical Dictionary 2012). Around the globe, United Nations Children's Fund (UNICEF) and its partners like World Health Organization (WHO) and Global Alliance for Vaccines and Immunization (GAVI), the United State centers for Disease Control, the Bill & Melinda Gates foundation and others including numerous non-governmental organizations jointly act to ensure that vaccines protect all children, especially those hardest to reach and most in need (Sourabh, 2016). According to World Health organization bulletin (WHO Bulletin, 2018), many children in the United Kingdom (UK) died from diseases such as whooping cough, measles and polio recently due to shortage of vaccines.

Many developing countries had difficulty in ensuring that children received prescribed course of immunizations and Nigeria inclusive, the United Nations Children's Fund (UNICEF) has regarded immunization as an important component of child survival programmes (WHO Bulletin, 2018). According to Adetukunbo (2007), immunization of children is one of the most cost effective public health interventions. The ultimate goal of immunization is eradication of diseases globally. Tinashe (2015) reiterated that others refused immunization based on religious beliefs. Some groups of parents consider compulsory vaccination as undesirable act of undermining individual rights (Brown, Oluwatosin and Ogundeji, 2015). This is because of poor understanding and provision of immunization services (Regmi, 2015). Nigerian Demographic and Health Survey (NDHS, 2018) report revealed that there is very low coverage of immunization service in the country, and the poor rates recorded are due to some factors mentioned in some studies for instance, Kabir and Ahamadu (2016) found that numerous factors like inadequate knowledge of vaccination, lack of proper locations, lengthy waiting time, conveyance problems, inadequate medical amenities and poor incentive slowed down even acknowledgement of the goals of immunization packages, also Rasheed (2017) exposed that socioeconomic aspects like income status, occupation, poor health amenities and incentives also hindered and caused variations in utilization of immunization services. Similarly, socio-economic and demographic factors like mother's age, child gender, marital and educational conditions of the mother were considered to be the factors influencing immunization services. These influences cut across all states and are mostly found in the northern region of Nigeria (Rasheed, 2017). Data from the 2018 National Demographic and Health Survey (NDHS), revealed that children whose mothers have no education are more likely to die young (170 deaths per 1000 live births) than children whose mothers have more than secondary education (56 deaths per 1,000 live births), also under five mortality is more than 3 times higher among children in the poorest households (173 deaths per 1,000 live births) compared to children in the wealthiest households (53 deaths per 1,000 live births).

As children develop they are exposed to many risks, one of these risks being infections most of these will cause illnesses, however, despite medical advances, infection can still cause severe illness, disability and, at times, death (Kabir and Ahamadu 2016). Before the introduction of global immunization, out of estimated 125million children born worldwide every year, approximately 12 million or nearly 10% die before the age of one, 97% of the deaths occur in the developing countries and Nigeria inclusive. Also over 800,000 newborn babies died from neonatal tetanus and over

275,000 children in the developing world were affected by paralytic polio every year in most cases before the age of 3, tuberculosis had as many as 10 million victims every year, and most of the affected children are under the age of 5 (WHO Bulletin, 2018). It is estimated that out of every 1000 Nigerian children, 187 will die before their fifth birthday, measles alone accounting for about 50% pertussis 600,000 deaths annually, neonatal tetanus 800,000 deaths, with a case fatality rate of about 85% occurring every year with few deaths but polio is now reduced drastically (WHO Bulletin, 2018). In Nigeria, the trends in vaccination coverage revealed that children aged 12-23 months with no vaccinations from 1990 were 36%, 2003 27%, 2008 29%, 2013 21%, and in 2018 is 19%, also all basic vaccinations coverage has gradually increased from 29% in 1990 to 31% in 2018 which is inadequate (NDHS, 2018).

Gombe state is experiencing influx of people since when it was created in the year 2000; this leads to increase population with diverse societies especially in the Gombe Local Government Area which serve as the capital of the state, Gombe state Primary Healthcare Development Agency (GSPHDA, 2019). It was reported by the World Health Organization (WHO, 2018) that Gombe state recorded less than 50% coverage of immunization due to numerous factors which include cultural and religious beliefs, poor records keeping, poor outreaches and little awareness to the parents of the 0-23 months children. Furthermore, according to Gombe Local Government Area Primary Healthcare Department (GLGPHCD, 2019) revised report that in 2018, out of the 506,129 0-23 month's children, more than 2/3 are not immunized in the area which is below the expected target. Among the principal causes of mortality and morbidity in Gombe Local Government Area are vaccine preventable diseases such as pneumonia, tuberculosis, and neonatal tetanus (Gombe State Ministry of Health, 2010). According to Nigerian Demographic and Health Survey (NDHS, 2018), north eastern part of Nigeria is one of the regions in the country with the second highest total fertility rate (TFR) with 6.1 live birth per woman, and Gombe state emerged the second highest with TFR of 6.6 live births per woman in the region and this is showing the relevance of this study (investigation). Furthermore, Verbal and Social Autopsy Study (2019) shows that north eastern region emerged second to the last with children reported to have received at least one immunization with 59.5%. Nigerian Demographic and Health Survey (2018) also shows that Gombe state emerged the least in terms of all age appropriate vaccination with just 6.1% in north east and recorded the highest with children with no vaccination of 34.4% in the region. It has been proved that in the whole country, Gombe state emerged the fourth least with children with no vaccination, hence, this will be one of the reasons why the state recorded the highest number of infant and child mortality in north east with 189 deaths per 1000 live births, because immunization is one of the indicators used to monitor progress towards reduction in child morbidity and mortality.

Therefore, what are the reasons behind high mortality rate in the area, perhaps government give less contribution in the immunization services, misperception of immunization by the parents of children or the influences of demographic and socioeconomic statuses of the parents like education, income, occupation, religion, age, ethnicity, contributing on the setback of child development in the study area while the child development through immunization is a key fundamental element of public health and prerequisite to social and economic development, and a crucial element that enables every child to reach his or her full physical and intellectual potential (Oyefara, 2014). Ahmed (2016) studied the spatial analysis of tuberculosis spread in Gombe Local Government Area of Gombe state, the study applied Global Positioning System (GPS) in collecting the coordinates of the Health centers and used nearest neighbor analysis to examine the Tuberculosis spread in the area, the study revealed that lack of access to healthcare centers, public education on Tuberculosis, are the major causes of Tuberculosis disease in Gombe Local Government area. Muhammad (2016) studied spatio temporal analysis of polio cases in Kaduna

central senatorial zone where both primary and secondary data were used and results show that polio cases have been declining within the study area from 2006-2014 due to the wider immunization coverage.

Mihigo et al., (2017), studied challenges of immunization in the African region using both primary and secondary data, result showed that issues of sustainable funding and resources for immunization, vaccine stock outs and logistics, data issues and laboratory infrastructure, are the major problems of immunization in the African region. Meleko et, al., (2017), studied child immunization coverage and associated factors with full vaccination among 12-23 months children of Bench Maji zone, south west Ethiopia, the study design was community-based cross-sectional survey, data were collected using pretested structured questionnaire results show that mothers and fathers educational level, place of delivery, maternal health status, mothers knowledge about vaccine and vaccine preventable diseases showed significant relationship with full child immunization. Also Adebisi (2013) studied determinants of full child immunization among aged 12-23 months children in Nigeria, both primary and secondary data were used, and the results shows that demographic and socioeconomic features like religion, culture, income, education plays significant role on immunization uptake.

Aim and Objectives

The aim of this study is to provide empirical information on the spatial distribution pattern and factors affecting immunization as a way of vaccine preventable diseases eradication in Gombe Local Government Area of Gombe state, Nigeria. The aim could be achieved through the following objectives:

- i. To map out the spatial distribution of children immunization centers in Gombe Local Government Area.
- ii. To examine the influence of mother's demographic and socio-economic characteristics on child immunization in Gombe Local Government Area.
- iii. To examine the role of Government in immunization services in Gombe L.G.A.

Theoretical Framework (Health Belief Model)

Health Belief Model was developed in the 1950's by social psychologist Hochbaum Rosenstock and others, also Anti-vaccine conspiracy theory of Daniel Jolly and Karen Douglas (2014), people are motivated to take care of their health and family members before considering other material needs. They consider health as a fundamental aspect of which without it nothing can go okay in all humans' endeavors. The later theory of Douglas emphasize on the issues that may cause barriers to vaccine uptake which are detrimental to the children health conditions, while the first one of Charles Abraham shows how perception of parents or people in general influences vaccine uptake, it emphasizes that humans are to think positively before actions, meaning that people should not misrepresent immunization as a negative way of causing backwardness to population (Rosenstock, 1995).

Determinants of Immunization Services

Religion and occupation, plays significant role more on immunization because the Muslim Hausa/Fulanis are more than half of the population in Gombe, also Income Occupation and Education are usually linked together and are characterized with cities and most developed areas of which Gombe LGA is part of developed Areas in Nigeria being the state capital (Independent National Electoral Commission [INEC] 2006).

Rasheed (2017) exposed that socioeconomic aspects like income status, occupation, poor health amenities and incentives also hindered and caused variations in utilization of immunization services. Similarly, socio demographic factors like mother's age, child gender, marital and educational conditions of the mother were considered to be the factors influencing immunization services, these influences cut across all states and are mostly found in the northern region of the country.

Tinashe (2015) reiterated that others refused immunization based on religious beliefs. Some groups of parents consider compulsory vaccination as undesirable act of undermining individual rights (Brown, Oluwatosin and Ogundeji, 2015). This is because of poor understanding and provision of immunization services (Regmi, 2015). Nigerian Demographic and Health Survey (NDHS, 2018) report revealed that there is very low coverage of immunization service in the country, and the poor rates recorded are due to some factors mentioned in some studies such as Kabir and Ahamadu (2016) found that numerous factors like inadequate knowledge of vaccination, lack of proper locations, lengthy waiting time, conveyance problems, inadequate medical amenities and poor incentive slowed down even acknowledgement of the goals of immunization packages.

Occupation plays significant role in immunization services as most of the women in Gombe engaged in doing something to earn money due to variety of business opportunities around the Area (Gombe State Diary, 2018).

Furthermore, Age of women have been found to influence immunization, because it had a strongest and most consistent relationship with women of reproductive age 15-49 and they are the ones in the starting point of delivery (Gombe Local Government P.H.C Department).

Importance/ Benefit of Immunization

The benefits or importance of child immunization can never be over emphasized as it protects children from vaccine preventable diseases and most importantly eradication of morbidity and reduction of mortality rates around the globe (World Health Organization, 2010).

Methodology

In every research to be conducted, there must be appropriate methods to be used in conducting it, therefore this research involves the use of qualitative and quantitative techniques from both primary and secondary data. The primary data were collected through field observations and interviews from mothers/care givers of children 0-23 months of age, while the secondary data were obtained from existing literature which include records from: Gombe state Ministry of Health, Gombe Local Government Primary Healthcare Development Agency (GSPHDA), Independent National Electoral Commission manual, Gombe Local Government Primary Healthcare Department, and other published and non published materials. This study also involves the use of 506,129 0-23 months' children as sampling frame in the study based on the Rew Micro Plan records of Gombe Local Government Area, Primary Health care Department (2018), in which 400 were used as sampling size of the women/caregivers which were derived through the use of Yamane (1967) formula that gave the sample sizes. Data collection was done through the use of questionnaire and interview, also sampling techniques used were simple random to obtain the streets samples and systematic sampling technique to obtain the sample of houses in each sampled street by the use of dice to determine the sequence of intervals of houses to be skipped in the 11 political wards. However, numbering was used in counting houses and streets from which the samples were derived. Lastly, this research employed the used of Inferential and descriptive

statistics like: Regression Analysis, cross tabulations, frequency tables and percentages as well as the use of qualitative techniques to analyzed data obtained from the field.

Study Area

Location and Ariel Extent

The Geographical coordinates of the study area ranges between Latitude 10°14' 30''N and 10°19' 30''N and Longitudes 11°7' 0'' E and 11° 13' 30'' E (Satellite images of Gombe, 2015). It occupies an area of about 45Km² (ministry of land and survey Gombe, 2008). Gombe Local Government Area is located approximately at the center of Gombe state. It is bounded by Kwami L.G.A in the north and almost surrounded by Akko Local Government Area in the south east and south west; Gombe town is well linked by road to other regional centers like Biu/Maiduguri, Potiskum/Damaturu, Bauch/Jos, Kari/Kano, and Kumo/Yola (Adam Modu Abbas et, al. 2017).

Climate

The climate of Gombe state is part of tropical continental climate characterized by distinctive rainy and dry seasons. The wet season start around April to October with an average annual rainfall of 650-1000mm, while dry season commences around November to April with the coldest months in January and February. Relative humidity in pattern has been 94% in August and drops to less than 10% during Hamatan period (Gombe state diary, 2008). The dry season become distinctly severe when the north East trade wind over the region becomes established. The wind originating from the Sahara belt that is high pressure area at that period, this dry and dust laden wind produces the harsh conditions of the season. Temperature becomes lower at 75°F (25°C) particularly during the period from December to February due to the harmattan. Average relative humidity is also lowest at about 15% during the harmattan period of the dry season; this shows that climatic conditions hinders some parents in the area to patronize immunization services efficiently because of their businesses in the dry season and farming in the rainy season (Abdullahi 2017).

Topography and Hydrology

Gombe town is largely at the foot of Akko escarpment in the west of the town. Developments are taking up sites on the escarpment and on Tumfure plains as well as southwards and up the higher grounds to the east beyond the newer Liji area. The highest point on the landscape is on the Liji hills, and the sandstone hills dotting the southern parts of the town site. The highest part of the buildup area of the town is located at the western gateway of about 1850ft (610.5m) above the sea level and the lowest part at the BCGA areas with about 1250ft (412.5m) above the sea level. The study area in conclusion shows low grounds in BCGA, Yelon Guruza area, and high grounds located in Tunfure and Liji hills, many rivers truncate the older part of the town with all flowing eastwards from their source at the Akko escarpment. The rivers and streams, some of which have tributaries with active gullies have truncated the town, particularly at the north east parts, creating east striations on the landscape so this also affect the immunization coverage in the area due to the high lands and lowlands that makes some women difficult to go for immunization, also flowing of rivers during the rainy season (Gombe state diary, 2018).

Soils and Vegetation type

The soil is a tropical ferruginous type, dark grey in colour and has PH value ranging from 4-6, depending on the location (Layarank, 1990). The vegetation of Gombe is typically 'a high close canopy, with sprinkling of under shrubs and a sparse growth of grass to a more open grass of less height more spreading and stunted shrubs and dense growth of grass'. It can also be described as Sudan savanna with open grassland which dries up during dry season. The anthropogenic activities

affected and modified the natural vegetation through deforestation, overgrazing, bush burning, constructions and Agriculture, all these activities causes low patronage of immunization because of flooding, windstorm and other natural disasters especially in the rainy season (Abdullahi, 2017).

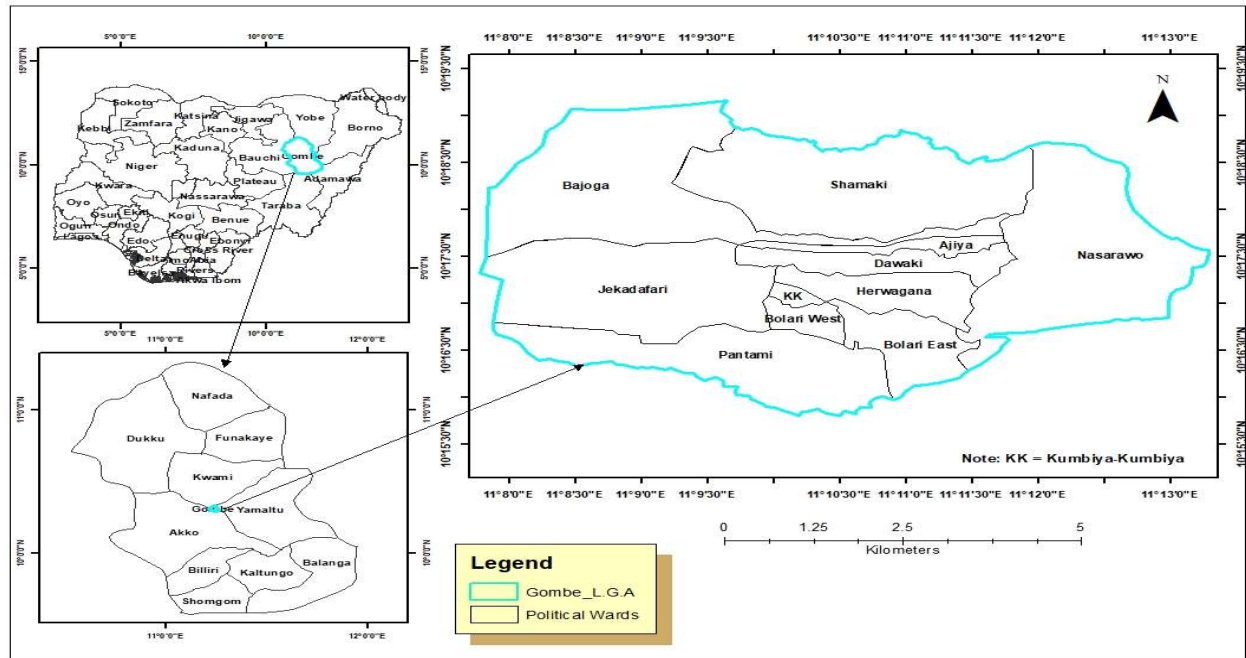


Figure 1: Gombe Local Government Area, Gombe State, Nigeria.

Source: Adapted from Administrative Map of Gombe (2021).

Health Sector

There are 21 (9-Maternity, 12-Dispensaries) primary health care facilities, 2 secondary healthcare facilities (general hospital and specialist hospital) and 1 tertiary which is the federal teaching hospital. There are 32 Private clinics and laboratory services and 7 TB Centers, health personnel workers are 157. The L.G.A has a school of health technology, 1 school of nursing and midwifery and a proposed college of medical sciences at the Gombe state university. International development partners (IDPs) in the health sector are World Health Organization, United Nations Children Fund, World Bank and MTN foundation. The Millennium Development Goals (MDGs) office in the presidency and the National Health Insurance Scheme (NHIS) are partnering with the Gombe L.G.A in achieving the sustainable development goals 4, 5, and 6, but still immunization is not well practiced as the immunization centers are inadequate and different perception of the masses (Gombe state ministry of health, 2010).

Population and People

According to National Population and Housing Census (2006), priority table, Gombe town has population of 266,844 people with males having 146,721, and Females having 120, 123 people, (National Bureau of Statistics, 2012). While according to population projection of 2021 by the united nation world population prospect, Gombe local government area has the total projected population of 529, 000 people at 3.93% growth rate. The people of Gombe could be said to be

diverse in terms of different languages spoken, the customs and the traditions being adhered to. According to Joseph Greenberg's (Undated) in Abba et al (2000), linguistic classification, the most dominant linguistic to be found in this area to the Afro-asiatic and Niger-Congo family of languages. Thus the ethno-linguistic composition of Gombe state include, among others, the Fulbe (Fulanis), Bolewa, Tera, Tangale, Tula, Waja, Wurkun, Jara, Dadiya, Cham, Awak, Pero, Kamo, Kushi and Bangunji. There are also more recent migrants such as Kanuri, the Hausa language, does serve the purposes of commerce, interaction, and of education at the lower levels of school systems. The English language remains the official language as obtains all over Nigeria and as a result of cultural diversity, immunization service in the area is affected (Abba, et, al. 2000).

Socio-economic Activities

Gombe state is abundant with physical, human and economic resources, it is the center of economic activities; it serves as the meeting point of investors from surrounding states which are: Borno and Yobe to the north and east, Taraba and Adamawa to the south and Bauchi to the west. This advantage triggers the state to be vibrant in all aspects. Again, the state is blessed with natural resources like coal, limestone, abundant land and so forth. There within the short period of time in existence, it encountered tremendous progress. In addition to that, the state is located in the sub-Saharan savannah thus it is a productive farming area cultivating crops like maize, millet, rice, guinea corn, sorghum, soybean, beans et.c, and vegetables like tomatoes, pepper, water melon, cabbage and so on. Gombe is the collection and distribution center for the cereals, which are transported by road and sold at many northern states and exported in to the Niger republic. The area is also beneficial in animal husbandry where hide and skin are produced for leather and the products are supplied to the southern states of Nigeria and Abuja, therefore these activities strengthen the economic base of Gombe. The occupational pattern of Gombe people is dominated by public service, Farming and business, and these activities tend to causes under utilization of immunization in the area because of the massive engagements day by day (Gombe state diary, 2018).

Results and Discussion

This section has been devoted to the analysis and discussion of results of the data collected from 11 wards in Gombe Local Government Area. All the data were formed in to tables and charts which shows frequencies and percentages of the variables used in the study Area. However, most of the above reviewed literatures shows less attention was paid to Gombe and any study on population characteristics in relation to immunization in Gombe is paramount important due to the current changes that are taking place in the area. Furthermore, most of the reviewed literatures focused on either some vaccine preventable diseases like tuberculosis, polio, Measles etc, as an entity but this study looked at the immunization in general perspective in Gombe. The study further investigates both the spatial distribution pattern and factors affecting immunization in Gombe L.G.A. the study does not focused on salary earners only but to all women that engage in various Occupations. In view of the above challenges of Immunization services in Nigeria and Gombe in specific, research of this kind is very important in order to investigate spatial distribution pattern and Demographic and socioeconomic economic factors affecting immunization in Gombe Local Government Area.

Spatial Distribution of Immunization Centers and Population

Spatial Distribution of Immunization Centers and their relation with the population is the pattern at which the density of population affect the Immunization through showing the maximum,

optimum, and minimum Population densities and how they affect immunization uptake in the study Area. Figure 2 shows the pattern and density of immunization uptake in the study Area.

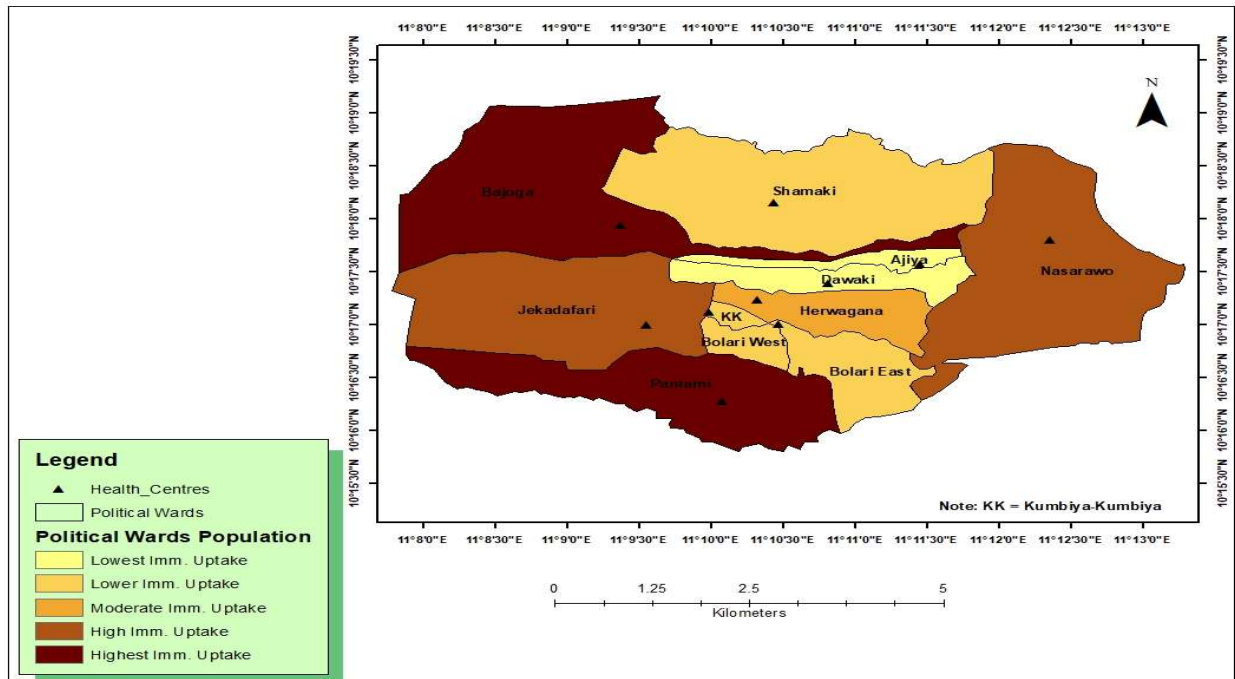


Figure 2 Mapping of the Immunization Centers showing relationship with the Population

Source: Federal University of Kashere, Geography Department G.I.S Laboratory, (2021)

As regards to the relationship between the immunization centers and Populace, Figure 2 shows that Bajoga, Pantami, Nasarawo, Jekadafari and Herwagana immunization centers experiences more immunization uptake but there is congestion, delay in the immunization services, waste of time to the women/caregivers of children 0-23 months of age due to their high population, as against other political wards that has sparsely population density in the study area like Ajiya, Dawaki, Kumbiya-Kumbiya and the rest, they also experiences slow immunization uptake. This analysis is true with reality of the situation in Gombe Local Government Area, because the numbers of houses in the later list are not as the numbers in the first. This is because Gombe L.G.A is part of developed Areas in Nigeria being the state capital, Independent National Electoral Commission (INEC, 2006).

Distribution of Demographic and Socioeconomic Characteristics of women and immunization in Gombe Local Government Area, Gombe State, Nigeria

Demographic and socioeconomic factors are considered as important variables that determine child immunization, because understanding these factors enabled the researcher to observe their influence on immunization uptake in the study area. Therefore this section presents statistical data analysis about the following demographic and socioeconomic factors: age, believe, income, occupation, educational levels and ethnicity.

Analysis of age groups in relation to immunization in Gombe LGA

Age is one of the important variables and a primary basis of demographic classification in a vital statistics, censuses and surveys. In fact, it is useful for the effective analysis of all forms of data obtained from the field (National Demographic and Health survey, 2018).

Table 4.4.1 Distribution of Age groups of respondents and Immunization in Gombe L.G.A

	Yes	No	Yes %	No %	Total	Age groups % total
Age 14 Yrs old	4	1	80	20	5	1
15-30	157	91	63	37	248	62
31-45	102	34	75	25	136	34
46-60	8	2	80	20	10	2
Above 60 yrs	1	0	100	0	1	1
Total	272	128	398	102	400	100

Source: Field Survey (2021)

Based on the Data on Table 1, all women between the age ranges of 60 and above accept Child immunization (100%), as against those at the age ranges of 15-30 years (63%) which are also more than half of the population. Similarly, those between that ages of 31-60 years (80%) immunize their children as well, and this shows that almost all women in Gombe encourages immunization uptake especially those between the age ranges of 60 years and above that encourages those younger ones (15-30 years) who happened to have the highest number in the population and are in the middle period of delivery this is in line with the statement of Gombe L.G.A primary health care Department (Gombe LGA, PHC Department, 2020).

Table 2 Distribution of Respondents Ethnicity and Immunization in Gombe L.G.A

Tribe	Yes	No	Yes %	No%	Total	Ethnic groups % total
Fulani	107	52	67	33	159	40
Hausa	110	55	68	33	165	41
Tangale	8	1	89	11	9	2
Tera	6	2	75	25	8	2
Bolewa	9	7	56	43	16	4
Waja	4	0	100	0	4	1
Others	28	11	72	28	39	10
Total	272	128	527	173	400	100

Source: Field Survey (2021)

Regarding the tribes in Gombe, Table 4.4.2 above shows which of the tribes take their children to immunization more, because Gombe Local Government Area is heterogeneous society and all the tribes were cross tabulated. It is observed that Waja/Tangale (100/89%) have the highest number in terms of immunization uptake because almost all their women carry their children to immunization and all Hausa/Fulani women too carry their children to immunization (67/67%) i.e almost two-third of their population, this is concurrent with Gombe state diary that the dominant population in Gombe state is Hausa/Fulani followed by Tangale/Waja (Gombe State Diary, 2018).

Table 3 Distribution of Respondents Religious groups and Immunization in Gombe L.G.A

Religions	Yes	No	Yes%	No%	Total	Religions % total
Islam	259	127	67	33	386	96
Christianity	12	1	36	14	13	4
Total	272	128	103	47	400	100

Source: Field Survey (2021)

As regards with religion according to Table 4.4.3, almost all Christian's women carry their children to immunization (86%), and about 2/3 of Muslim women too carry their children to immunization (67%). This is in line with reality of the statement in Gombe state diary, that Muslims in Gombe have the highest population, followed by Christians (Gombe State Diary, 2018). This is contrary to the findings of Tinashe (2015) which states that others refused immunization based on religious beliefs.

Table 4 Educational attainment of respondents and Immunization in Gombe L.G.A

Education	Yes	No%	Yes%	No%	Total	Edu.Att. % total
Primary	61	30	67	33	91	22
Secondary	126	73	63	36	199	50
Tertiary	24	7	77	23	31	8
Others	61	18	77	23	79	20
Total	272	128	284	115	400	100

Source: Field Survey (2021)

As regards to education and the level of Immunization in Gombe, Table 4.4.4 shows that education plays significant role on immunization uptake in Gombe, because about 2/3 of 0-23 months children mothers with tertiary education accept immunization (77%) than all other women with primary or secondary certificates, and those whom does not go to even primary school like adult education, incomplete primary education etc, their level of immunization uptake is also significant (77%). This is because Gombe Local Government Area is the center and the city of Gombe state, it comprises of highly educated people with varied educational background, and therefore even those without formal education emulate the educated ones, so they are aware with the benefits of childhood immunization uptake. This is in line with the study of Adedokun et, al. (2017) that studied the child immunization uptake in Sokoto and found that mothers/caregivers education play significant impact on the immunization uptake as against illiterate mothers.

Table 5 Occupation of Respondents and Immunization in Gombe L.G.A

Occupation.	Yes	No	Yes %	No%	Total	Occupation %
Civil Servant	26	11	70	30	37	9
House Wife	19	109	15	85	128	32
Farmer	15	0	100	0	15	4
Trader	176	7	96	4	183	46
Others	35	1	97	3	36	9
Total	271	129	378	122	400	100

Source: Field Survey (2021)

Regarding occupation and level of immunization uptake in Gombe LGA, Table 4.4.5 shows that all women of 0-23 month's children who are farmers carry their children to immunization (100%)

and about 98% of women practicing domestic businesses and trader carries their children to immunization as well, also more than two-third of women who are civil servants in the study area (70%) utilizes immunization as against house wives (15%) that does not have occupation, this in line with Ahmed (2016) that house wives has the lowest rate of immunization utilization while civil servants and farmers use the service more than other occupations. Others who practices domestic business about 99% of them carry their children to immunization, and those who are civil servants and traders, more than half of them patronizes immunization in the study area as against those without occupation. This is because most of the women in Gombe engaged in doing something to earn money due to variety of business opportunities around the Area (Gombe State Diary, 2018).

Table 6 Income status of respondents and Immunization in Gombe L.G.A

Income	Yes	No	Yes%	No%	Total	Income status %
1,000-20,000	205	115	64	36	320	80
21,000-50,000	62	11	85	15	73	18
51,000-100,000	4	2	67	33	6	1
Above 100,000	1	0	100	0	1	1
Total	272	128	316	84	400	100

Source: Field Survey (2021)

As regards with income statuses of respondents and immunization in Gombe, it is observed in table 4.4.6 that the higher the earning of woman, the higher the immunization uptake because those earning higher amount of 100,000 and above, all of them carry their children to immunization (100%), as against those that get at least 1000 naira per month, this is in line with Ahmed (2016) that women earning below 1000 naira, had the lowest immunization rate, where as all the women earning above 50000 naira immunized their children. The middle income earners that get 21,000-51,000 more than two-third of them take their children to immunization (85% and 67% respectively). This is because the Area comprises people with different educational background and they are not redundant, thus most of women in the Area get money because they work for it (Gombe State Ministry of Health, 2010).

Table 7 General Analysis of Demographic and Socioeconomic Characteristics and Immunization in Gombe L.G.A

Model	Coefficients ^a			T	Sig.
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta		
Age	-.035	.029	-.039	-1.196	.232
Ethnicity	.004	.009	.013	.410	.682
Religion	-.262	.078	-.108	-3.365	.001
Educational	-.021	.016	-.042	-1.286	.199
Occupation	-.270	.014	-.649	-9.921	.000
Income	-.101	.036	-.090	-2.788	.005

Source: Authors Field Survey (2021)

As regards the demographic and socio-economic statuses of the respondents in general, multi-linear regression analysis was used in the table 4.4.7, it is observed that Income (0.005), religion (0.001) and occupation (0.000) plays significant role more on immunization uptake than the other set of variables. It is also observed that majority of respondents (80%) in the study Area earn less than 20,000 naira per month. The Hausa/Fulanis also occupy more than half of the population. Furthermore, income, occupation and education are usually linked together and are characterized with cities and most developed areas, therefore, Gombe LGA is part of developed Areas in Nigeria being the state capital, Independent National Electoral Commission (INEC, 2006).

Content Analysis

Interview with the staff of Gombe State Ministry of Health and Gombe State Primary Healthcare Development Agency

Firstly, According to the Gombe State Primary Health Care Development Agency (GSPHCDA), The Agency was established in 2013, during the Alhaji Ibrahim Hassan Dankwambo Administration (former governor of Gombe state) with only five Departments namely: Finance and Administration Department, Disease control and Immunization Department, Department of primary Health care and system development, Department of planning research and statistics and finally Department of community and family health.

Secondly, there are only two types of immunization which are: Routine immunization which is done frequently and in every facility like primary, secondary and tertiary health care facilities, then supplementary Immunization which is done in form of campaigns like polio, Meningitis and so on, there was no any law that makes immunization to be compulsory. The Agency was set up by an act of law in response to the National agenda establishing Primary Healthcare Agency in Nigeria to implement primary Healthcare (PHC) components with a view to improving the quality of PHC services delivery for Gombe state.

Thirdly, Parts of the primary roles of the organization are reviewing the existing policies in the state, providing relevance in the development of primary healthcare and primary health facilities, promote and monitor the implementation of health plans in the state primary healthcare systems, provide strategic technical support for the implementation of priority primary health care components, mobilize resources within state, nationally and internationally in support of the programmes of the agency etc.

Fourth, the contribution on immunization is majorly given by partners like World Health Organization (WHO), United Nations Children's Fund (UNICEF), and some other nongovernmental organizations (NGOs). The government normally plays its role by creating sensitization programmes like providing of man power (human resource), organizing of staff trainings, remunerations, creating awareness or through other means of communication like Television, Radio, and so forth. Similarly, the Gombe state government also plays a significant role in providing some Immunization facilities and equipment as well as renovating Immunization centers that collapse.

Fifth, It is was noticed that people appreciate the government in social media, Television, and radio due to its effort in tackling diseases especially vaccine preventable diseases in the state and its attempt on internal issues of immunization services and other things like renovations of demolished healthcare centers, trainings, and provision of some drugs in the Area. Regarding the level of acceptance of immunization in Gombe, it was confirmed that Gombe Local Government Area reached about 80% in its uptake being the state capital and gathered highly educated people with different social background.

Sixth, on the issue of Immunization and Child development, as per as the organization is concerned, immunization is definitely a positive way of improving child health and all of their staff considers it by taking their children to the immunization and they see positive results on the health development of their children. On the other hand, it was observed that at times people misperceived immunization due to some cultural beliefs (religion, ethnicity, age, gender etc), also even among the staff, there are few that have the habit of what is called “ vaccine hesitancy among health workers”, therefore they will not take it serious by carrying their children to immunization, and at times, their children experiences serious illness (morbidity), and at the end mortality may occur, that was one of the reason it was reported recently by the Nigerian Demographic and Health Survey (NDHS,2019), that Gombe state is one of the states in the north east with high level of child morbidity and mortality.

In view of the above information, the researcher observed that government role in immunization services in Gombe Local Government Area is very minimal and there was no any law that makes immunization to be compulsory, but still the level of acceptance of immunization in Gombe reached about 80%. The major source of providing Immunization services is through partners like United Nations Children Funds (UNICEF), World Health Organization (WHO), Philanthropies and other nongovernmental organizations, and the above analysis shows clearly government contribution than the partners in terms of vaccines allocation, fridges for cooling of the vaccines, books, magazines, and journals for guidance on vaccines administrations as well as other necessary facilities and equipments for proper immunization services in the study Area. It was also observed that even among the immunization officials there are few that do not agree with the immunization and this habit is known as “vaccine hesitancy among health workers”.

Summary of Findings

This study analyzed the spatial distribution pattern of immunization in Gombe Local Government Area of Gombe State, Nigeria. Cringing Analysis in ArcGIS 10.4 was used to identify the spatial distribution of Immunization centers and their relationship with population around them. Inferential and Descriptive statistics (Linear regression, Cross tabulation, descriptive statistics) containing Tables and charts were employed in analyzing data on spatial distribution of Immunization centers and their relationship with population as well as the impact of demographic and socioeconomic factors on immunization in Gombe Local Government Area of Gombe state, Nigeria.

Results of the study revealed that government Immunization Centers in Gombe Local Government Area are not enough to provide essential immunization services to the people in the area. It was observed that the population around the political wards was unevenly distributed, that is why their level of immunization differs. It was observed that Bajoga, Pantami, Nasarawo, Jekadafari and Herwagana Immunization centers experiences more immunization uptake but there is congestion, delay in the Immunization services waste of time to the women/caregivers of children 0-23 months of age due to their high population, as against other political wards that has sparsely population density in the study Area like Ajiya, Dawaki, Kumbiya-Kumbiya and the rest. The researcher found that some demographic and socio-economic characteristics of the respondents like occupation, religion, education, ethnicity income, and, age plays significant role on Immunization Uptake respectively. This is in contrary to the World Health Organization report of (WHO, 2015) which states that Gombe state experiences low immunization uptake with less than 50% coverage, and the Nigerian Demographic and Health Survey (2019) that said that Gombe state emerged the least in terms of all age appropriate vaccination with just 6.1% in north east

and recorded the highest with children with no vaccination of 34.4% in the region, also with high level of children morbidity and mortality in Nigeria.

On the issue of Government role on Immunization, it was found that government focus only on the internal issues like renovations, buying drugs, sensitization programmes and so on, but the major contribution on Immunization services are coming from partners like World Health Organization (WHO), United Nations Children Funds (UNICEF) and so forth.

Conclusion

Immunization is no doubt a way of tackling vaccine preventable diseases and a way of increasing child health and development. It was noted that in Gombe, the pattern distribution of immunization services differ due to uneven population density, but it has impact on the children immunization as some children are denied due to proximity problem, congestion, waste of time and the rest, while some are not facing this problem. Also demographic and socioeconomic determinants of the people influences immunization uptake in Gombe due to spatial distribution but government role in the immunization services is very minimal compared to that nongovernmental organizations such as United Nations Children Funds (UNICEF), World Health Organization (WHO), Bill and Melinda Gates Foundation and so on.

Recommendations

In line with the findings of this work, the following recommendations are made:

- i. Government should improve awareness campaigns and empowerment of parents especially women/caregivers of the study Area.
- ii. Additional Health care facilities should be constructed around some Areas of the Political wards like Bajoga, Pantami, Nasarawo, Jekadafari, Herwagana, and Bolari West, for effective Immunization service delivery to avoid congestion and waste of time to the mothers/caregivers.
- iii. Government should also encourage formal education to higher levels in the study Area as higher qualification is one of the key factors that influences immunization uptake.
- iv. Traditional and religious leaders should put hands in encouraging parents on the immunization uptake in the study Area.
- v. Further researches should look at the impact of other childhood diseases on the development of children in the study Area.
- vi. Women in the study Area should be empowered to have variety of knowledge through awareness programmes.
- vii. Results from interview with the relevant immunization authorities revealed that there is little effort of government intervention on the immunization services in the study area; therefore, government should put more effort as the contribution from partners is not guaranteed forever.
- viii. The masses in the Local Government Area should be enlightened on the present situation of immunization and to be encouraged on its compliance so that level of its uptake will be made available for future investigations.
- ix. Government should employ additional manpower for efficient and easy immunization services, easy networking systems should be provided for easy report of monthly, quarterly or annual immunization status to the Federal capital territory Abuja.
- x. Available power supply should be ensured to avoid vaccine spoilage in refrigerators.

- xi. Further researches on Vaccine preventable diseases and other child killer diseases are encouraged so seek their impact on people of Gombe local Government Area of Gombe state.

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