COVID-19 Vaccine: Challenges of the distribution and vaccination in North-West Nigeria and the way forward

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Abstract : **This cross-sectional study examines the challenges of COVID-19 vaccines: distribution and vaccination across the seven (7) states of the North-West region of Nigeria that include Katsina, Kaduna, Kano, Kebbi, Zamfara, Sokoto, and Jigawa states. A summary of secondary data was obtained at the website of the Nigeria Center for Disease Control (NCDC) and the National Primary Health Care Development Agency (NPHCDA) on the 14th and 15th of April 2021. A simple descriptive analysis was conducted on the data. The research findings revealed that a total number of 17,016 laboratory confirmed cases were reported; 747,800 AstraZeneca Vaccines were distributed, a total number of 221,829 people were vaccinated with the first dose of the vaccine as of 15th of April 2021. Out of the 17,016 laboratories' confirmed cases, more than half (53%) were recorded from Kaduna state while less than 1% were reported in Zamfara state. The reason for such several confirmed cases in Kaduna state was partly due to the large number of travelers who came in and out of the state from Abuja, the Federal Capital Territory which had one of the highest numbers of cases in the whole of Nigeria. Case Fatality Rate (CFR) at the regional level was given as 1%, while Sokoto and Kebbi states were leading by 4% each. Analysis of the findings revealed that about 98% of the 17,016 laboratories' confirmed cases in the region had been discharged, while 1% were still on admission. The study also revealed that COVID-19 vaccines were not proportionally distributed according to the number of confirmed cases in each state. Apart from Kano and Katsina states whose percentages of confirmed cases were almost equal to the percentages of vaccines distributed i.e., 23%-to-28% and 12%-to-14% respectively, other states in the region had received below or above the proportion of confirmed cases they had. For instance, Kaduna state had 53% of confirmed cases in the region only received 24% of vaccines distributed, whereas Zamfara state which had the lowest percentage of confirmed cases (1%) received 7% of vaccines distributed. Major challenges facing COVID-19 within the region were an inadequate number of vaccines to cater to the large population of the people within the region, inadequate testing centers, etc. Most of the testing and vaccination centers were found in the cities and not found in the rural areas. The study concludes with a recommendation that government should make available vaccines in both the urban and rural communities and encourage people to take the vaccines.**

***Keywords*: COVID-19 vaccines, distribution, vaccination, North-West Region.**

I. INTRODUCTION

1.1 Background

Coronavirus disease (COVID-19) is a disease caused by a newly emerging novel coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2) that appeared in late 2019 disseminating to cause a global pandemic in 2020[1].The name COVID-19 was announced by the World Health Organization (WHO) in February 2020, following guidelines previously developed with the World Organization for Animal Health (OIE) and the Food and Agriculture Organization (FAO) of the United Nations [2].The advent of COVID-19 in Wuhan, China in December 2019 has created an extraordinary challenge to the global health system which was eventually declared a global pandemic by the World Health Organization (WHO) on 11 March 2020 and has been associated with over 3 Million deaths as at mid-April 2021[3], [4]. COVID-19 has not only become a public health crisis but has also affected the global economy thereby creating a significant economic impact across the globe due to reduced productivity, loss of life, business closures, trade disruptions, and devastation of the tourism industry among others [5].

Many African countries have gone far in rolling out their distribution plans for the COVID-19 vaccines which they have procured, only few countries lag behind the rest of the world on vaccine rollout which accounts for less than 2% of

all COVID-19 vaccines administered worldwide while countries like Britain have given almost half of the population the first dose of the COVID-19 vaccine[15], [16].To guide needed communications and engagement strategies to support the rollout of COVID-19 vaccines, it is vital to understand public attitudes across Africa [4]. The availability of a safe and effective vaccine will make a remarkable contribution to stop the COVID-19 pandemic by preventing the susceptible population from infection and disease, stopping viral transmission, and improving herd immunity[39].The situation largely mirrors the challenges with vaccine rollout which the rest of Africa will be working to overcome in the fight to end the pandemic[16].

In Nigeria, the first case of the COVID-19 disease was confirmed by the Federal Ministry of Health in Lagos State, Nigeria[10]. The case was an Italian citizen who works in Nigeria and returned from Milan, Italy to Lagos, Nigeria, and was confirmed on the 27th February 2020 after a laboratory confirmation by the laboratory of Lagos State University Teaching Hospital[10]. Thereafter, Northern Nigeria had its first case reported by the medical charity Doctors Without Borders (MSF) reported that a Nigerian nurse in Borno state died from COVID-19, raising concerns that the contagious virus was now present in the northern region[11]. Unfortunately, many Nigerians regarded the pandemic as a distant white man's infirmity that could never spread to their abode [41]. Kano state, a hub for commercial activities in the northern region and also the most populous state in Northern Nigeria with an estimated population of over 13 million people recorded its first positive case on 11th April 2020, and as of 9th June 2020, there have been 1004 cases, 477 recovered with 49 deaths[1].

The World Health Organization and partners immediately swung into action by working together on the responses, tracking the pandemic, advising on critical interventions, and distributing vital medical suppliers to those in need, before racing to develop and deploy safe and effective vaccines[27]. The WHO and partners including CEPI GAVI and UNICEF worked together under the umbrella name: Global Vaccine Collaboration (COVAX) to end the acute phase of the COVID-19 pandemic by speeding up the development of safe and effective vaccines against COVID-19; supporting the building of manufacturing capabilities; and working with governments and manufacturers to ensure fair and equitable allocation of the vaccines for all countries[12], [27].

According to UNICEF, Nigeria received nearly 4 million doses of the COVID-19 vaccines as its first consignment. COVAX shipped 3.94 million doses of the AstraZeneca/Oxford vaccine, manufactured by the Serum Institute of India (SII), from Mumbai to Abuja in the early month of March 2021 thereby marking a historical step towards the goal of ensuring equitable distribution of COVID-19 vaccines globally[12], [14]. The government immediately distributed and commenced the vaccination of its citizens against COVID-19 by starting with the healthcare workers who are often at the risk of exposure to infections, including COVID-19, as they are the first responders to patients[13].

Vaccines are prospective subverts in battling the COVID-19 virus ravaging the globe and the Nigerian cold-chain system needs a thorough overhaul in order to optimize vaccine distribution[6].Nigeria has a widespread poor performance of vaccine supply chain delivery system which could be due to lot of factors like age of the cold chain system, vaccine arrival, storage capacity, stock management, distribution and information system, a vulnerable health system faced with prolonged health system vulnerabilities due to delayed reforms, corruption, and looting of funds earmarked for the reformation of the health care system[3]. For years, corruption has dealt with the health care system thereby making it a high burden of chronic diseases such as diabetes mellitus, hypertension, and so on among the population of the country, thereby predisposing the majority of them to COVID-19[3]. Already frail public health systems have buckled further under the weight of the pandemic, with the most recent impact being a doctors' strike[16].

Despite the strategic position of Nigeria in the African continent for its economic strength, and sophistication of its government oversight structure, its health care system has suffered major setbacks and the nation is seriously underserved in the healthcare sphere especially in the rural areas [3],[30].The government tried to put various reforms in place to address the wide-ranging issues in the health care system and these reforms are yet to be implemented at the state and local government area levels[3]. As a corollary, Nigeria has not maximized fully the opportunities provided by these reforms [44].

It is evident that Nigeria was not as well prepared for the COVID-19 outbreak as at the time when the first case was recorded, and thus the response was inadequate[3]. With a dilapidated health care system and the poor socioeconomic status of most its population, Nigeria is vulnerable to the disastrous effects of COVID-19[3].Infectious disease outbreaks of large magnitude, such as COVID-19 need special attention beyond the routine in terms of resources and procedures, as they have tendency to significantly impact the nation's economy and health system[29].

The arrival of COVID-19 into Nigeria made the federal government to take some measures to contain and mitigate the impact of COVID-19 pandemic by establishing the Presidential Task Force (PTF) mandated by the government with the powers of coordinating and overseeing Nigeria's multi-sectoral inter-governmental efforts to contain the spread and mitigate the impact of COVID-19 and also provide overall policy guide and provide continuous support to the National Operations Center EOC, NCDC, NPHCDA etc. involved in response activities and ensure their coordination towards a single set of national strategic objectives[43]. The NCDC supported the states in the establishment of emergency operation centers (EOC), trained rapid response teams in all

the states across the country, build capacity for contact tracing and case management, strengthened some laboratories for optimum diagnostic capacities etc.[29].

1.2 Challenges of vaccine distribution and vaccination across the North West Nigeria

Vaccines are prospective subverts in battling the COVID-19 virus ravaging the globe and the Nigerian cold-chain system needs a thorough overhaul in order to optimize vaccine distribution[6].The challenges facing Immunization in Nigeria and North-West Nigeria in particular is very critical and it is very obvious the government focus is more on the development of a COVID-19 vaccine, less attention has been paid to the extent to which vaccine could be accepted in the country[40]. However, even a highly effective vaccine requires sufficiently widespread willingness to accept it to successfully protect populations at large[25]. There are many factors contributing to public acceptance of vaccines including concerns about safety and efficacy, as well as the spread of misinformation which is particularly rampant in the context of the COVID-19 pandemic[4], [25].Knowledge, attitudes and practices of the people toward COVID-19 is critical to understanding the epidemiological dynamics of the disease and the effectiveness, compliance and success of Infection Prevention and Control (IPC) measures adopted in the country[41].There are several, demographic, individual, socio-political, financial, and cultural dimensions that interplay to influence the adoption and implementation of new health interventions like COVID-19[40].

It is very clear the government is not sincere about making sure there is equitable distribution of the vaccines within the 36 states of the federation including Abuja the capital city[15].Vaccine inequity threatens progress in the fight to control the pandemic and will contribute to pushing the poorest Nigerians further into poverty and reducing their quality of life and well-being of the people[16].Nigeria's 200 million people have been severely impacted by the COVID-19 pandemic with high unemployment rates, inflation, and ongoing insecurity in various parts of the country[16].Unfortunately, the Nigerian Health care system is poorly developed largely due to the inability of the government both at Federal, State and Local Government Level to effectively address the country's numerous public health challenges which contributed to the persistent and high level of poverty and the weakness of the health system[18].

Nigeria is a multi-ethnic, multi-cultural and multi-religious country and is currently experiencing a rapid spread of the virus amidst weak health system and more than 80% of population leaving on less than 1USD per day[40],[42]. At the time Nigeria started its COVID-19 vaccination across the country, over 155,000 COVID-19 cases have been reported in the country and over 1,900 deaths were also reported[13]. Since COVID-19 spread at a fast rate, individuals from vulnerable health systems and poor socioeconomic backgrounds are particularly at risk[3].

Research findings have revealed that the North-West Nigeria has the lowest vaccination rate among the seven (7) states of the geopolitical regions of the country[30].The Multiple Indicator Cluster Survey[34] and the Demographic and Health Survey have also revealed that [33]. Multiple Indicator Cluster Survey (MICS) reveals that only 14% of children are immunized in North-West region which comprises of Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara. NDHS survey findings placed same North-West region as having only 29.1% of children who are immunized in the entire region. These two surveys placed North-West region as the lowest in terms of routine immunization coverage among the entire six geo-political regions of Nigeria. These figures are by far below the national immunization target of 80% coverage as contained in the RI Strategic Plan[32]. These low immunization coverage in both the surveys reveals that only 14% children (MICS) and 29.1% children (NDHS) received pentavalent vaccine by the time they reach their first birthdays. The entire countries immunization coverage based on the MICS survey is 33% which is also very low when compared to the national target. These are the reasons why Immunization coverage in Nigeria is too low for controlling any vaccine preventable diseases including COVID-19 [37].Experiences with the GAVI-supported routine immunization programs in Nigeria shows vaccination coverage rates differ across the country with higher coverage rates in the southern states compared to the north, and within states, higher coverage rates in urban compared to rural areas[40].

This study will help the government and researchers to assess some of the major challenges that COVID-19 vaccine distribution and vaccination is facing in North-West Nigeria after the distribution of the first batch of the AstraZeneca vaccines and the vaccination of the first dose of the vaccine, and provide a way forward towards mitigating the challenges. The study will help in identifying some of the major challenges facing the distribution and administration of vaccines in the region based on immunization experience that has been happening in the region

1.3 Objectives

The main objectives of this study is to assess the challenges facing COVID-19, vaccine distribution and vaccination in North-West region. The specific objectives are to:

1. Review Literatures on challenges of vaccine distribution and administration.
2. Examine the incidence rate of COVID19 within the reference period.
3. Study the rate of vaccination attendance for the first dose.

II. LITERATURE REVIEW

2.1 Background

Vaccines and immunization generally are cost effective public health tools in reducing the burden of infectious diseases[26].Vaccines reduce risks of getting a disease by working with your body's natural defenses to build protection and when you get a vaccine, your immune system responds[27].The increase in vaccination activities has helped halve childhood mortality by preventing more than 14 million future deaths and dramatically driven down the incidence of deadly and debilitating infectious diseases[28]. Before the coming of COVID-19 in 2019, immunization alone prevents 2-3 million deaths every year from diseases like diphtheria, tetanus, pertussis, influenza and measles[27]. Immunization and vaccination are two of the most important public health interventions and constitute a cost-effective strategy to reduce both the morbidity and mortality associated with infectious diseases[31]. Apart from the fact that vaccines prevent diseases, it also goes beyond prevention of ailments and death, it also presents some economic gains for individuals and communities and these tells that paying more attention to vaccines promises a significant yield of improved quality of life socioeconomically as well as in the field of public[26]. Even before the coming of COVID-19, many literatures have shown that immunization coverage in Nigeria is among the lowest worldwide and the country is one of countries with lowest immunization coverage for routine antigens below 50% of coverage [30].Another finding revealed that Nigeria currently has a cold chain capacity of 201m^2 and needs a total capacity of 672m^2 to meet up with demands. Hence, there is a 70% deficit of the routine maximum demand [6].With the persistent increase in population, onset of new diseases, advent of novel vaccines and breakdown of cold chain equipment (CCE), the current cold chain capacity is bound to be insufficient[6].

Some literatures on vaccination based on some research findings on immunization in North-West Nigeria have also revealed that the issue of low immunization coverage in North West Nigeria is attributed to low political will from the side of the government, ethnicity and religious beliefs, poor community involvement and participation, poor social support, Lack of funding etc.[35], [36]. Similarly, a research study conducted in Northern Nigeria on "Knowledge, perception and beliefs of mothers on routine childhood immunization in a Northern Nigerian Village" revealed that some of the reasons why parents/caregivers do not take their children for routine immunization services are religion, attitude and cultural believes of parents/caregivers[47]. Another research finding conducted in Zamfara State North-West Nigeria also reveals that knowledge and education status of parents/caregivers as some of the major reasons why parents do not take their children for immunization services[45].Individual, community and state level factors such as illiterate mothers/caregivers who did not attend anti natal care during pregnancy, who delivered at home, who lived in rural areas, who had difficulty getting to health facility are set of parents that are likely to have their children not immunized based on a research finding by this researcher[46]. Understanding the factors that influence the completion of routine immunization schedules in the North-West region was a gap that needed to be filled[30].In addition, findings by the USAID in 2018 revealed that the challenges of immunization in the entire northern Nigerian states include attitude, culture and religion, lack of education and awareness[48]. The polio vaccination refusal saga in 3 states namely (Kano, Zamfara and Kaduna) of North- West Nigeria between 2003 and 2004 is a grim reminder of how public mistrust of government intentions and the international community, political and religious discordances and poor community engagement can disrupt a vaccination program intended for the good of the people with grave consequences[38],[40].

On the aspect of COVID-19, a research study on COVID-19 revealed that geographical location and acceptance of the COVID-19 vaccine are significantly associated together based on responses of respondents from southern part of Nigeria, who are likely to take the COVID-19 vaccines compared to those that came from the Northern part of the country [52].This study revealed that 25% of the respondents disagreed with taking the COVID-19 vaccine whenever it was made available because vaccine unreliability of clinical trials, the immune system is enough to combat COVID-19, the vaccine is not safe are the top reasons for non-acceptance by the respondents[52].One of the consequences of this is that it makes people have doubts about the efficacy of the vaccines[15].When compared to the finding of another research work which is almost similar to this, the researcher revealed that worry about side effects, doubt about vaccine effectiveness and perception of not being at risk from COVID-19 are the three (3) solid reasons for none acceptance of COVID-19 vaccines[49].In addition to what has happened in Nigeria, a multi-national research study in Europe revealed that more than half of the respondents were more concerned about the potential side effects of the vaccine[50]. Findings of these research discoveries in literatures globally are clear signs of hesitancy that COVID-19 vaccine is facing[51],[52].

III. RESEARCH METHODOLY

3.1 Study Design and Data Used

The researchers conducted a cross-sectional study using the following secondary data: number of vaccines distributed, total clients vaccinated (1st Dose), percentage of target reached, number of cases (Lab. Confirmed), number of cases (on admission), number discharged and number of deaths as provided by the National Center for Disease Control (NCDC) and National Primary Health Care Development Agency (NPHCDA) on their website and downloaded on the 14th and 15th of April 2021 for use in this research study. A simple descriptive analysis was conducted on the data which produced the results of the reseach findings. The results of the

findings helped the researchers to answer the research questions. In addition, several literatures were also reviewed and findings from those literatures reviewed, were also used in answering the reseach objectives.

3.2 North-West Region

Nigeria has six (6) different geopolitical zones which includes North-East region, North-West Region, North-Central Region, South-West Region, South-East Region, South-South Region. Each of the six geopolitical zones contains states and people of similar culture and historical background[8]. The North-West region covers seven (7) states namely Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara States. However, the region majorly consists of Hausa's and Fulani's and the religion in the region is majorly Islam[7].However, the region is home to the Hausa people who also happened to be one of the top three major languages in Nigeria, although apart from the Hausa Language, there are several other small groups of languages who make up the population like, for example, Kaduna State contains languages like Baju, Fulani, Jabba and several other ethnic groups as indigenous settlers[8]. The Hausa, people constitute the largest ethnic group in the region, which also contains another large group, the Fulani, perhaps one-half of whom are settled among the Hausa as a ruling class, having adopted the Hausa language and culture[9]. In addition, the North-West region of Nigeria offers a wide range of Islamic beauty and culture, from the Seat of Caliphates in Sokoto to the Land of Equity to the Free Trade Zone in Jigawa[7]. Below is the map (Figure 1) of Nigeria showing the states that formed the north-west region.

Figure 1: Map of Nigeria showing 7 North-West States

3.3 Ethical Clearance

The researchers have not requested for any ethical clearance because the data used by the researchers was made available on the website of the NCDC and NPHCDA. The secondary data that was used in this research study was made available at public domain by these two bodies to be use by the general public. Projected target population for 2021 was also used which was made available by the World Health Organization (WHO) who worked together on a yearly basis using the yearly growth rate formular for each state as provided by the National Population Commission (NPC) based on the 2006 population census figures to come up with a yearly estimate of the population figures. Each and every year, the WHO makes available to the public domain projected population figures to be used in health planning activities across the country. All the data and information used by the researchers from National Centre for Disease Control (NCDC), National Primary Health Care Agency (NPHCDA), World Health Organization (WHO), National Population Commission (NPC) and other sources were duly acknowledged and referenced by the researchers for evidence and reference purposes.

IV. RESEARCH ANALYSIS, FINDINGS AND EVALUATION

4.1 Research analysis

A simple descriptive analysis was conducted on the secondary data obtained at the website of the Nigeria Center for Disease Control (NCDC) and the National Primary Health Care Development Agency (NPHCDA) on the 14th and 15th of April 2021. The Simple descriptive analysis conducted include percentages and frequencies e.g., Percentage of distribution of confirmed cases, percentage of distribution of discharged, Percentage of cases on admission, Case Fatality Rate (CFR), Percentage of Vaccines Distributed, Incidence Rate of COVID-19, Percentage of Population Targeted for Vaccination, are the types of results found after the analysis was conducted on the secondary data. The analysis conducted gave answers to the research objectives. Tables 1 to table 7 below shows each and every analysis conducted for each of the seven (7) states of the North West region.

4.2 Research Findings

In the Northwestern region, a total of 17,016 COVID-19 confirmed cases were reported as at 15th April 2021. Out of these confirmed cases, more than half (53%) were recorded in Kaduna state while less than 2% reported in Zamfara state. The reason for such number of confirmed cases in Kaduna state is partly due to its proximity to the Federal Capital Territory which has one of the highest number of cases in the whole of Nigeria.

Case Fatality Rate (CFR) at regional level was given as 1%, while Sokoto and Kebbi states were leading the estimate of CFR by 4% each.

The analysis of statistics depicts that about 98% of the 17,016 confirmed cases in the region had been discharged, while 1% were on admission. A further analysis shows that Kebbi state had the highest proportion (by state level) of confirmed cases that were on admission.

The findings revealed that COVID-19 vaccines are not proportionally distributed according to the number of confirmed cases in each state. Apart from Kano and Katsina states whose percentages of confirmed cases are almost equal the percentages of vaccines distributed i.e., 23%-to-28% and 12%-to-14% respectively, other states in the region have received below or above the proportion of confirmed cases they have. For instance, Kaduna state which has 53% of confirmed cases in the region only received 24% of vaccines distributed, whereas Zamfara state which has the lowest percentage of confirmed cases (1%) received 7% of vaccines distributed. The disproportional distribution of COVID-19 vaccines will not only give improper monitoring of the success of the administration of vaccines in the states, it may instigate avoidable/controllable spread of the pandemic within (and probably beyond) a state that received below the proportion of its confirmed cases.

Table 1: Data on COVID-19

S/No.	States Affected	Vaccines Distributed	Total Client Vaccinated (1st Dose)	Percentage of Target Reached	No. of Cases (Lab Confirmed)	No. of Cases (on admission)	No. Discharged	No. of Deaths
1	Kaduna	179,830	55,604	61.8 %	8,998	28	8,905	65
2	Kano	209,520	56,942	54.4 %	3,935	20	3,805	110
3	Katsina	107,540	39,297	73.1 %	2,097	14	2,049	34
4	Sokoto	68,660	11,560	33.7 %	775	1	746	28
5	Jigawa	68,520	27,644	80.7 %	527	26	485	16
6	Kebbi	57,810	15,531	53.7 %	450	42	392	16
7	Zamfara	55,920	15,251	54.5 %	234	5	221	8
		747,800	221,829		17,016			

Source: NCDC, NPHCDA, [19], [20], [21], [22], [23], [24]

Table 2: Percentage Distribution of Confirmed Cases

S/No.	States Affected	Vaccines Distributed	No. of Cases (Lab Confirmed)	% Distribution of Confirmed Cases
1	Kaduna	179,830	8,998	53%
2	Kano	209,520	3,935	23%
3	Katsina	107,540	2,097	12%
4	Sokoto	68,660	775	5%
5	Jigawa	68,520	527	3%
6	Kebbi	57,810	450	3%
7	Zamfara	55,920	234	1%
		747,800	17,016	

Source: Data Analysis for the Study

Findings from Table 2 above shows all the number of the confirmed cases in the North-West region with Kaduna State having 53% of the laboratory confirmed cases of the COVID-19 which makes it to be the highest confirmed cases in the region while Zamfara has the lowest with only 1%.

Table 3: Percentage Distribution of Discharged Cases

S/No.	States Affected	Vaccines Distributed	No. of Cases (Lab Confirmed)	No. Discharged	% Distribution of Discharged
1	Kaduna	179,830	8,998	8,905	99%
2	Kano	209,520	3,935	3,805	97%
3	Katsina	107,540	2,097	2,049	98%
4	Sokoto	68,660	775	746	96%
5	Jigawa	68,520	527	485	92%
6	Kebbi	57,810	450	392	87%
7	Zamfara	55,920	234	221	94%
		747,800	17,016		

Source: Data Analysis for the Study

Just like the case of confirmed cases, Table 3 above shows that Kaduna State had the highest percentage of people with COVID-19 cases that were discharged from medical facilities across the state. The percentage stood at 99% while the total number of people discharged were 8,905 people. Kebbi and Zamfara state had the lowest percentage of people discharged which stand at 87% and 92% respectively.

Table 4: Percentage of Cases on Admission

S/No.	States Affected	Vaccines Distributed	No. of Cases (Lab Confirmed)	No. of Cases (On admission)	% Of Cases on admission
1	Kaduna	179,830	8,998	28	0%
2	Kano	209,520	3,935	20	1%
3	Katsina	107,540	2,097	14	1%
4	Sokoto	68,660	775	1	0%
5	Jigawa	68,520	527	26	5%
6	Kebbi	57,810	450	42	9%
7	Zamfara	55,920	234	5	2%
		747,800	17,016		

Source: Data Analysis for the Study

In Table 4 above, the results revealed Kebbi state has 9% of people with COVID-19 cases that are on admission in the state.

Table 5: Case Fatality Rate (CFR)

S/No.	States Affected	Vaccines Distributed	No. of Cases (Lab Confirmed)	No. of Deaths	Case Fatality Rate (CFR)
1	Kaduna	179,830	8,998	65	1%
2	Kano	209,520	3,935	110	3%
3	Katsina	107,540	2,097	34	2%
4	Sokoto	68,660	775	28	4%
5	Jigawa	68,520	527	16	3%
6	Kebbi	57,810	450	16	4%
7	Zamfara	55,920	234	8	3%
		747,800	17,016		

Source: Data Analysis for the Study

Table 5 above shows that Case Fatality Rate (CFR) in the region was 1% in Kaduna State, while Sokoto and Kebbi states were leading with the estimate of CFR by 4% each.

Table 6: Percentage Distribution of Vaccines by States

S/No.	States Affected	Vaccines Distributed	% Of Vaccines Distributed
1	Kaduna	179,830	24%
2	Kano	209,520	28%
3	Katsina	107,540	14%
4	Sokoto	68,660	9%
5	Jigawa	68,520	9%
6	Kebbi	57,810	8%
7	Zamfara	55,920	7%
		747,800	

Source: Data Analysis for the Study.

From Table 6 above, it can be observed that Kano state which was the most populous state in the region had the highest percentage of vaccines distributed which was 28%, followed by Kaduna state which had 24%. However, Zamfara state had only 7% of vaccines distributed.

Table 7: Incidence Rate of COVID-19 and Percentage of population targeted for Vaccination.

S/No.	States Affected	State Population (Projected for 2021)	Vaccines Distributed	No. of Cases (Lab Confirmed)	Incidence Rate of COVID-19	% of Population Targeted for Vaccination
1	Kaduna	9,451,506	179,830	8,998	0.095%	1.903%
2	Kano	15,271,374	209,520	3,935	0.026%	1.372%
3	Katsina	9,024,648	107,540	2,097	0.023%	1.192%
4	Sokoto	5,759,804	68,660	775	0.013%	1.192%
5	Jigawa	6,677,055	68,520	527	0.008%	1.026%
6	Kebbi	5,119,659	57,810	450	0.009%	1.129%
7	Zamfara	5,228,686	55,920	234	0.004%	1.069%
		56,532,732	747,800	17,016	0.030%	1.323%

Source: Data Analysis for the Study

As shown in the above table 7, the overall incidence rate of COVID-19 in the region was 0.030% with the highest incidence rate (of 0.095%) from Kaduna state and the lowest rate (of 0.004%) from Zamfara state.

As contained in the table above, it is very clear that the government had not made sufficient provision for the population as regards COVID-19 vaccinations. Putting the population of each state side by side with the available vaccines, it is clear that less than 2% (both at regional and state levels) will be prevented from COVID-19.

4.3 Limitations

This research study relied on the summary of secondary data made available by the National Centre for Disease control (NCDC) and the national primary health development Agency (NPHCDA) accessed on the 14th and 15th of April 2021. As such, the researchers could not have access to the raw data to enable the researchers conduct different forms of analysis on the data. Lack of the raw data stopped the researchers from aggregating the data to local government area, ward or community levels thereby rendering the data to a limited type of analysis to conduct.

4.4 Conflict of Interest

The authors have declared that there was no any competing interest during the conduct and publication of this research work. No any financial support from neither individual, group nor corporate organization that sponsored this publication. This publication is purely self-sponsored.

4.5 Acknowledgement

The researchers appreciate the effort of the National Centre for Disease Control (NCDC) and the National Primary Health Care Development Agency (NPHCDA) for their effort in

making the COVID-19 vaccines available, provide testing sites and kits, ensure the availability of all COVID-19 related cases are made available on their web sites and also the World Health Organization and National Population Commission who made available the estimated 2021 target population used in this research study.

IV. CHALLENGES, RECOMMENDATION, CONCLUSION

5.1 Challenges

- Inadequate testing centers across the region and most of these testing centers are located at the major cities across the states which makes it difficult for people from the rural areas to be tested for COVID-19.
- Based on the number of the vaccines received, it is very clear that the number of vaccines is too small to cater for the large population of people in these states although there are strong indications the government will make available more of the vaccines.
- Delay in receiving testing results: It takes more than 24 hours before you have access to test result.
- Political interference in the areas of the vaccine distribution and vaccination

5.2 Recommendation

- Government should make available more vaccines to cover the large population of people within these states. This should be of utmost priority for the government.
- Government should work towards building, staffing and equipping more health centers to reach out to people at the rural areas.
- Government should have a strong database for all those that have collected the first dose of the vaccine so that they can easily be traced to come back and collect the second dose when it is due without much delay.
- Government should use lessons learned from both Routine Immunization (RI) and supplementary Immunization activities (SIA) experiences in these states to come up with a better plan on how to deal with the challenges facing COVID-19 vaccine: distribution and vaccination across the region.
- There is urgent need to scale up more testing centers and capacity in order to effectively monitor the vaccine distribution and vaccination across the region.

5.3 Conclusion

Even though COVID-19 vaccine was made available in all the seven (7) states of the North-West region and vaccination of the first dose of the vaccine has started. Findings have revealed that the COVID-19 vaccine manufactured by AstraZeneca and distributed in these states was not enough to cater for the population of the people. It has become very clear that Nigeria may not meet its COVID-19 vaccination target of the 78.8 Million people in the next seven months to meet up its target as planned[53]. Therefore, it has become imminent for the government to use the population of the people in these states as a yardstick for the procurement and distribution of vaccine across the entire region and the country at large. This is one of the only ways the government can critically work towards ending the pandemic by recommending 60% to 70% vaccines coverage as much as possible globally and eventually end the COVID-19 pandemic[16]. In addition, the government needs to work towards promoting public trust by assuring the general public of the safety and effectiveness of the vaccine. Health authorities at both the state and local government, stakeholders and policy makers in Nigeria need to ensure the general public that access to the COVID-19 vaccine is equitable when it becomes available across the states and country at large[52].

This research study highlighted some of the basic challenges confronting vaccine distribution and vaccination in the North-West Region. The methodology used offers a clear picture of events based on the number of vaccines distributed and the number of the people who collected their first dose of the vaccines across the region.

Finally, for Nigeria to achieve success in health care in this modern era and to tackle challenges of pandemics like COVID19, a system well-grounded in routine surveillance and medical intelligence as the backbone of the health sector is necessary, besides adequate management couple with strong leadership principles [17].

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