Original Research Article

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Assessing the capacity of primary health care centres to provide routine immunization services amidst COVID-19 lockdown in Kaduna state, Nigeria

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ABSTRACT

Background: The COVID-19 pandemic continues to disrupt health systems across the globe, preventing access to essential health services. Lockdown measures against the virus may impact negatively on immunization services. This study aimed to ascertain the capacity of primary health care centres in Kaduna North senatorial district to provide routine immunization services amidst a state-wide lockdown.

Methods: Cluster sampling was used to select four among eight local Government areas in the district. Facility incharges and RI focal persons were interviewed using service availability and readiness assessment tool, restricted to immunization tracer items. Paired sample t-test was used to compare the mean number of vaccine doses given in the first quarter of 2020 (pre-lockdown) and the number of doses given in the second quarter (lockdown period).

Results: Forty four PHCs were selected from Zaria (29.6%), Sabon Gari (25.0%), Makarfi (22.7%) and Kudan (22.7%). In addition to well-trained RI focal persons, most facilities had vaccines and commodities available. Shortages were noted for EPI guidelines (46%), Meningitis-A vaccine (36%) and certain cold chain equipment (up to 18%). Tetanus-diphtheria (Td-1) doses given during lockdown period were significantly lower than pre-lockdown doses (Mean difference=-45.58, 95% CI: -74.78 to -16.38, d=0.48). No significant difference exists for infant doses.

Conclusions: Despite widespread availability of PHC facilities, trained personnel, vaccines and commodities, gaps still exist in service delivery, cold chain practices and vaccine supply management. Lockdown measures significantly disrupted immunization services and effective risk communication was key to achieving sustained utilization.

Keywords: Immunization, Lockdown, Primary health care, Kaduna, Nigeria

INTRODUCTION

Primary health care (PHC) is an essential health care service intended to be sustainable, equitable and accessible to all. In 1978, the world gathered in Alma-Ata to declare it the key strategy towards attaining health for all. Immunization against major vaccine preventable diseases is one of the eight minimum components of PHC. Nigeria affirmed this declaration and has made

substantial efforts towards implementing its provisions throughout the federation.^{2,3}

In Kaduna state, PHC implementation is based on ward health system (WHS) that recommends at least one functional, properly-equipped and adequately-staffed PHC centre per electoral ward.⁴ To meet this target, the Kaduna State government, through the state primary health care development agency (SPHCDA) embarked on an aggressive mission of renovating, equipping and

staffing selected PHC centres across the state with many of them now fully operational, providing basic health services including routine immunization for infants and pregnant women.⁴

The COVID-19 pandemic which began in Wuhan province of China wreaked havoc on global community and its healthcare systems. Nigeria's first case was recorded in February 2020, following which many states went into lockdown in an attempt to contain the virus. In Kaduna State, the quarantine order which came into force on 26th of March lasted for 75 days.^{5,6}

Reports have shown that lockdown measures against COVID-19, even when fully justifiable, could have negative impact on other public health services including routine immunization. Because routine immunization heavily relies on a complex global supply chain, severe shortage of vaccines and essential commodities could result from supply disruptions, decrease in production and cross-border controls. Even within health care facilities, essential staff may be diverted to the pandemic response, indirectly affecting immunization services. In addition, overall vaccine demand and uptake may be hampered by movement restrictions and fear of getting COVID-19 infection during immunization services.

Therefore, the aim of this study was to assess the capacity of PHC centres in Kaduna State to provide routine immunization services during the COVID-19 pandemic and also to ascertain the impact of the state's quarantine order on vaccine demand and supply using Kaduna North senatorial district as a case study.

METHODS

Kaduna is one of the 36 states of Nigeria with an estimated population of 9 million people spread across 23 local government areas (LGAs). ¹¹The state is divided into three senatorial districts; North, South and Central. This cross-sectional study was conducted among upgraded PHC facilities in Kaduna North senatorial district, which comprised of eight LGAs; Ikara, Kubau, Kudan, Lere, Makarfi, Sabon Gari, Soba and Zaria.

Cluster sampling was used to randomly select four among the eight LGAs in the senatorial district. Each LGA consists of several electoral wards and each ward has a model PHC that is renovated by the state to carter for the ward community. In this study, all the model facilities in the selected LGAs, which served as the secondary sampling units, were automatically enrolled and their total number corresponds to the number of electoral wards in the four LGAs.

Data was collected using the WHO standardized service availability and readiness assessment (SARA) tool with specific focus on vaccination tracer items. ¹² The questionnaires were administered by two trained research assistants and only facility in-charges, second in-charges

or routine immunization (RI) focal persons were allowed to respond to the questionnaires on behalf of their facilities. Additional information was obtained regarding total vaccine doses given in first quarter of 2020 before the state went into lockdown and second quarter of the same year during most of which the lockdown was in place. For material resources and equipment, only items brought forward, seen and verified by the research assistants were reported as being available in the facilities.

In all the LGAs visited, permissions to conduct the study were obtained from the Directors of Public Health as well as the facility in-charges or second in-charges depending on their availability. Data collection took place between July and October 2020. Data was analysed using Statistical package for the social sciences version 23 (IBMSPSS Chicago, Illinois, United States) and presented using frequencies and percentages. Paired sample t test was used to compare differences in the mean number-of vaccine doses given in first and second quarters of 2020 and significant difference was defined as p value less than 0.05. Bar charts were drawn using Microsoft Excel 2010.

RESULTS

Four LGAs, namely; Zaria, Sabon Gari, Makarfi and Kudan were selected. All the eligible PHCs in these LGAs were automatically included in the study. A breakdown of the number of PHCs included per LGA is shown in (Table 1). Zaria had the highest number of PHCs with 13 (29.6%), followed by Sabon Gari LGA with 11 (25.0%). In total, data was collected from all the 44 upgraded PHC facilities in the area, giving a response rate of 100%.

Table 1: PHC facilities in the four LGAs selected, October 2020.

LGAs	Number of PHCs	Percentage
Zaria	13	29.6
Sabon Gari	11	25.0
Makarfi	10	22.7
Kudan	10	22.7
Total	44	100.0

All the PHCs visited provide immunization services on daily basis. In addition, all the PHCs also had dedicated RI focal persons that handle, administer and maintain immunization records. The various vaccine related trainings the RI focal persons received in the two years preceding the survey (Figure 1). All of them received training on new vaccine prior to introduction, injection safety and waste management as well as vaccine data reporting and monitoring. Forty two (96%) RI focal persons also received training on immunization service delivery, vaccine management, handling and cold chain,

whereas 40 (91%) received trainings on improving community vaccine coverage and diseases surveillance.

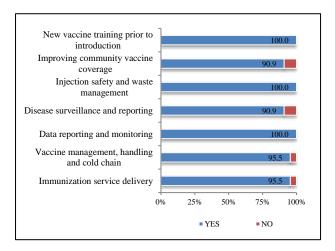


Figure 1: Trainings received by facility RI focal persons in the two years prior to the study October 2020.

The availability of vaccine commodities in the facilities as seen and verified by the research assistants is shown in (Figure 2). Immunization cards, registers and tally sheets were available in all the facilities visited. Similarly, all facilities reported having at least one vaccine carrier, ice packs and auto-disable syringes. Three facilities (7%) had no safety boxes and up to 20 facilities (46%) could not produce their national programme on immunization guidelines.

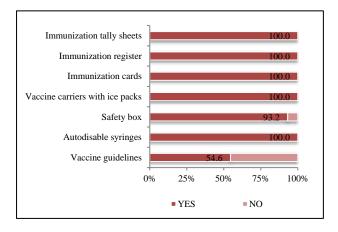


Figure 2: Availability of vaccine commodities within the facilities, October 2020.

The availability of cold chain equipment and pattern of utilization across the 44 PHC facilities visited is shown in (Figure 3). Forty one (93%) had a functional solar-powered refrigerator for vaccine storage. Three facilities did not have such refrigerators and were using vaccine carriers to collect vaccines from nearby facilities. Functional thermometers and loggers were found available in 39 (87%) and 36 (82%) of facilities respectively. On examination, only 34 (77%) facilities regularly monitor their refrigerator temperatures (i.e.

twice daily) and the temperature logging charts were complete in only 32 (73%) facilities.

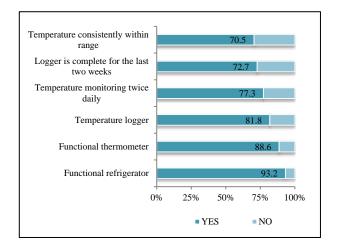


Figure 3: Availability and utilization of cold chain equipment in the facilities, October 2020.

In terms of vaccine availability, we found that hepatitis B vaccine (HBV), oral polio vaccine (OPV), inactivated polio vaccine (IPV) and pentavalent vaccines were available in all the facilities visited. measles and yellow fever were not available in one and two facilities respectively (Figure 4). The least available vaccines were meningitis A conjugate vaccine (men-A) available in only 28 (64%) facilities, followed by tetanus-diphtheria toxoid, available in 38 (86%) and BCG vaccine, available in 39 (89%) facilities.

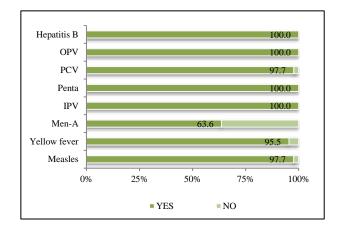


Figure 4: Availability of vaccines in the facilities, October 2020.

When asked if they had experienced any stock outs, many facilities reported having at least one episode of vaccine stock out since the quarantine order was declared in the state. Men-A shortages affected nearly half of all facilities (46%), followed by BCG (36%) and yellow fever vaccines (32%) (Figure 5). Fewer facilities experienced shortages of HBV, tetanus-diphtheria toxoid (Td), measles and IPV. No facility reported any stock out of OPV, pneumococcal conjugate vaccine (PCV) and pentavalent vaccines as at the time of the study.

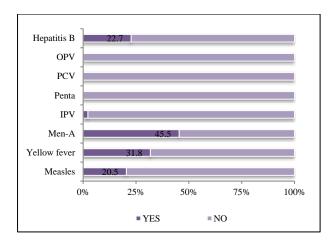


Figure 5: Facility level vaccine stockouts since beginning of COVID-19 lockdown in Kaduna state, October 2020.

The average numbers of penta-1, penta-3 and Td-1 doses given in the first and second quarters of 2020 was

compared using a paired sample t-test (Table 2). The mean numbers of penta-1 doses given in the two consecutive quarters were almost identical. Although the mean number of penta-3 doses given in the second quarter was slightly lower than the number given in the first quarter (144.50 versus 146.36), the mean difference was however, not statistically significant (-1.86, 95% CI:-14.73 to 11.00). On the other hand, a statistically significant decrease was observed between the mean number of Td-1 doses given to pregnant women in the first and second quarters of 2020 (234.65 versus 189.07) (-45.58, 95% CI:-74.78 to -16.38, d=0.48).

DISCUSSION

This study aimed to assess the capacity of PHCs in Kaduna North senatorial district to provide routine immunization services amidst COVID-19 lockdown and was conducted shortly after the quarantine order was relaxed. We found that despite the pandemic response, all the facilities in the area continued to provide within-facility daily immunization services.

Table 2: Facility level vaccine doses given before and during the lockdown in four LGAs of Kaduna North senatorial district, October 2020.

Vaccine	First quarter		Second quarter		Mean difference	95% Confidence interval
	Mean	SD	Mean	SD	Wiean difference	95 % Confidence interval
Penta-1	154.70	82.94	154.91	95.14	0.21	- 11.07-11.48
Penta-3	146.36	77.51	144.50	89.42	-1.86	- 14.73-11.00
Td-1	234.65	154.34	189.07	130.44	-45.58*	- 74.78-16.38

^{*}Significant mean difference (p<0.05)

We found that RI focal persons received various vaccine related trainings and majority were up-to-date in areas of immunization service delivery, vaccine management, data reporting and surveillance. A study from Bangladesh also noted similar pattern of training where 96% of health workers received training on expanded programme on immunization (EPI). Training health workers on immunization services is a key strategy for improving quality of immunization service delivery. Evidence has shown that such trainings work by improving health workers' knowledge, skill and competencies on general immunization service delivery, vaccine management and data management. 14-16

Current study found that all the facilities visited had adequate vaccine commodities with only few lacking safety boxes. Of particular concern, however, was the issue of national EPI guidelines, which could not be sighted in about half of the facilities. Similar finding was made in Ethiopia, where 48% of PHC units were found to lack EPI guidance document.¹⁷ Indeed, a research conducted among selected health facilities in Bangladesh also found that none of the facilities visited had EPI guidelines despite providing routine immunization.¹⁸ The EPI guideline is an essential document meant to assist health workers in providing a standardized and uniformed immunization services. It is a valuable reference tool that

should be readily available for consultation during routine immunization services or in-house supportive trainings. It was found that cold chain equipment including solarpowered refrigerators; thermometers and temperature loggers were widely available in nearly all the facilities visited. However, we equally noted that a fraction of those facilities neither monitor their temperatures twice daily nor consistently chart the temperature readings. In a study conducted among PHC workers in nearby Giwa LGA, it was found that 83.7% reported always checking their refrigerator temperatures and up to 86.0% kept good records.¹⁹ This underscores the importance of strict temperature monitoring to preserve vaccine potency and avoid unnecessary vaccine wastages. There are indications though that cold chain practices are suboptimal across wide range of settings in Sub-Saharan Africa.²⁰⁻²² In Ethiopia, for instance, a survey of 860 primary health care units found that up to 60% were not monitoring their temperatures twice daily and temperature loggers were incomplete in up to 70% of the units.¹⁷ With respect to vaccine availability, we found that majority of the facilities had all the vaccines available and stored in their refrigerators. Vaccines commonly found in short supply were Men-A, BCG and Td. Expectedly, those were the same vaccines that had the most stock outs during the lockdown period, in addition to measles and yellow fever. Previous studies have shown that vaccine

stock outs are by no means uncommon in Nigeria²³⁻²⁵ and LGA level vaccine stock outs over a 12 month period can be as high as 82%.²⁶ Given such a background scenario, we found it particularly challenging to ascertain if our findings were due to the lockdown imposed or otherwise.

In terms of vaccine doses given to infants, our study found no significant difference between the number of penta-1 and penta-3 doses given before and during the lockdown period. This differs significantly from what was observed in some parts of India and Pakistan where vaccine uptake and mean daily visits during lockdown dropped by 57.4% and 52.8% respectively. 9,27 Several reasons applicable to our local context may explain our findings. First, when declaring the quarantine order, the state Deputy Governor made it clear that staff on essential duties including health workers, fire servicemen and security personnel would be exempted.²⁸ As such, people knew that hospitals and clinics would remain opened and essential services would continue despite the lockdown. Secondly, we also note that most of the PHC facilities were strategically located within the communities and many were within few minutes of trekking distance. This proximity might have encouraged mothers to sustain immunization visits knowing fully well that they were not likely to encounter any restrictions along the way. Thirdly, because most PHC facilities did not have a clear immunization catch up plan that is routinely communicated to mothers, it is likely that such mothers kept more strictly to their immunization appointments despite the lockdown order, believing that their infants would miss the opportunity for life if they chose to stay at home.

On the other hand, we found that the number of Td-1 doses given during the lockdown period was significantly lower than the number given before the lockdown period. This vaccine is usually given on the first ante-natal visit with continuation doses administered during subsequent visits. The fear of COVID-19 itself or the lockdown restriction might have encouraged pregnant women to delay ante-natal booking pending when the quarantine order was lifted or relaxed. This is particularly likely given that delayed booking is common in Nigeria and many women may not be too keen to start ante-natal visits during a lockdown period. ^{29,30}

Our study was challenged by several limitations, important among which was the lack of adequate facility level data for direct comparison. Comparing our data with historical trends would have strengthened the validity of our inferences and allow us control for seasonal variations in vaccine uptake. We also note the short duration of the study which limited our ability to study more latent and secondary effects of lockdown on immunization services. For instance, it is a well-known fact that indirect effects such as learning and regimen interruption effects on vaccine utilization may take longer time to manifest. In addition, the 75 day duration of the quarantine period did not exactly fit into the 90 days of

the second quarter and this leaves about 15 days in the tail end of that quarter during which people were allowed to move freely. It is likely that some infants and pregnant women rushed to the facilities as soon as the lockdown was eased to catch up on the vaccines they had missed prior. Such a scenario would decrease the mean difference in vaccine doses administered by increasing the total number of doses given in the second quarter.

CONCLUSION

Despite widespread availability of PHC facilities, trained personnel, vaccines and commodities, gaps still exist in service delivery, proper cold chain practices and vaccine supply management. Lockdown measures significantly disrupted the routine immunization services and effective risk communication was key to achieving sustained community confidence and uptake of immunization services.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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