Original Article

Impact of the Covid-19 Pandemic on Routine Immunization at Primary Healthcare Centres in Ogun State, South-West Nigeria

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Article History
Submitted: 19/11/2024; Accepted: 4/12/2024: Published: 23/12/2024

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ABSTRACT

Governments around the world responded to the COVID-19 outbreak by enforcing widespread lockdowns, closing borders, and banning large gatherings. In some countries, these extended lockdowns hindered access to essential healthcare services, such as routine immunization (RI). The objective was to assess the impact of the COVID-19 pandemic on RI at primary healthcare centres in Ogun State, Nigeria. A retrospective descriptive cross-sectional survey was employed to review the vaccination records of all children in Ogun State between 2017 and 2021. Data was extracted from the state vaccination registers using a proforma created on ODK (Open Data Kit) and analyzed using IBM® SPSS version 23.0. Line graphs were drawn to examine the trends of the vaccination coverage rates before, during and after the pandemic. Also, the F-Test was used to compare the group means, and the p-value was set at < 0.05 as significant level. The coverage rates for the antigens reviewed (BCG, Measles, and Penta 1 & 3) experienced a decline in all the Health zones (Hz) during the pandemic. Also, in all the Hz except Remo, the uptake for Measles, Penta 1and Penta 3 was significantly reduced in 2020 at the onset of the pandemic ($p<0.05$) compared to the previous years. The downward trend in the vaccination rate witnessed during the COVID-19 pandemic may be attributed to the major disruptions to the RI services. Therefore, there is a need for restoration of immunization services to pre-pandemic levels and catch-up children who missed immunization to prevent post-pandemic vaccine-preventable disease epidemics.

Keywords: COVID-19; Primary Healthcare Centre; Routine Immunization; South-West Nigeria; Vaccine Preventable Disease.

INTRODUCTION

Coronavirus disease (COVID-19) is an illness caused by a novel coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).[1] The emergence of this virus led the world into a crisis of unprecedented scale and scope.[2] Governments across the countries regulated the outbreak of this disease by implementing population-wide lockdowns, closing borders and halting mass gatherings.[3] The prolonged lockdowns in some countries affected access to essential healthcare services, with many children kept away from immunization. These disruptions have threatened critical life-saving services such as Routine Immunization (RI).[3] Routine immunization is essential for protecting children and women of childbearing age and achieving national and international disease control, elimination and eradication goals. The pandemic has further

Article Access
Website: www.wjmbs.org
10.5281/zenodo.14525114

How to cite this article
**Temitayo-Oboh AO, Ogundele OA, Ogunsola EA, Ahmed A, Azees AS, Imhonopi GB, Ajewole GA, Olorunfemi SO, Adewumi BE. Impact of the Covid-19 Pandemic on Routine Immunization at Primary Healthcare Centres in Ogun State, South-West Nigeria. West J Med & Biomed Sci. 2024;5(4):230-238. DOI:10.5281/zenodo.14525114.*

increased the susceptibility of countries to outbreaks of vaccine-preventable diseases (VPDs).[3] The pandemic has put many countries like Nigeria that are endemic to infectious diseases at an increased risk of outbreaks as the utilization of RI services might have deteriorated[3] coupled with preexisting barriers to childhood immunization like low coverage, especially in hard to reach and insecure areas, vaccine hesitancy/noncompliance, poor attitude and inadequate capacity of healthcare workers, poor cold chain capacity at all levels and the generally weak health system.[4] In an attempt to mitigate the devastating impact of the COVID-19 pandemic, the World Health Organization (WHO) issued a guideline calling for a temporary suspension of the operations of mass immunization programs across the globe.[3] According to the data collected by the WHO, the United Nations Children's Fund (UNICEF), The Global Alliance for Vaccines and Immunizations (GAVI), and the Vaccine Sabin Institute, the suspension of vaccination services in over 68 countries have put at least 80 million children under the age of one at risk.[3] In low- and middle-income countries (LMIC) with health systems already under strain, even temporary disruptions can leave a trail of devastating health, opening the doors to a possible devastating resurgence of other illnesses.[3] An analysis by GAVI estimated that a further 24 million individuals who were hitherto protected through vaccinations are now at risk, as approximately 90 mass vaccination campaigns were postponed.[3] With a continued decline in vaccine coverage rates, cases of intensified outbreaks of measles, diphtheria, pertussis, and other vaccine-preventable diseases (VPD) are drawing headlines, and multiple cases of polio and diphtheria have been reported across Pakistan and Afghanistan.[3] Babatunde OA et al. conducted a similar study in Oyo State, Nigeria, where routine immunization data before and after COVID-19 were analyzed, and a significant decrease in vaccination coverage rate for VPDs was noticed.[5]

These impacts on immunization services also have implications for national, regional, and worldwide immunization coverage targets. Before the pandemic, immunization had led to the near eradication of wild poliovirus as well as dramatic decreases in the incidence of measles, rubella, tetanus, diphtheria, and pertussis.[6]

These successes are a product of successful immunization campaigns that have filled the vaccine coverage gaps; however, many of the campaigns were paused to prevent possible infection of healthcare workers and slow community transmission during the COVID-19 pandemic.[6] With the disruptions of these programs, many countries are now at risk of polio, measles, and other outbreaks of vaccine-preventable diseases.[6] According to the July report of the WHO, preliminary vaccine coverage rates from the early months of 2020 showed a significant reduction in the number of children receiving all three doses of the DPT3 vaccine.[7]

However, since the outbreak of COVID-19, this cardinal child survival strategy has come under a huge threat in most of the developing world, like Nigeria.[8] Studies have been conducted in different parts of Nigeria, like Oyo state, to show the effects of the COVID-19 pandemic on RI in Primary Healthcare Centres (PHCs). However, the states had different performance levels on routine immunizations before the pandemic. Thus, the impact on RI may likely differ across the states or regions of the country, with more severe effects in some states than others, hence the need for this study to identify the impacts of the COVID-19 pandemic on routine immunization (RI) in Ogun State. In this study, we illustrate the potential impact of the COVID-19 pandemic on immunization coverage in Ogun State. The findings from this study would provide insights into the effect of the pandemic on existing vaccination strategies and hence help inform policy for effective planning for future pandemics and other crises.

MATERIALS AND METHODS

Description of the Study Area

Ogun State is a state in Southwestern Nigeria and is the homeland of people of the Yoruba ethnic group, constituting a substantial percentage of the people. It includes groups such as the Egba, the Ijebu, and the

Ikale. Other tribes in Ogun State include the Awori, the Ilaje, and the Yewa. Created in February 1976 from the former Western State, Ogun State borders Lagos State to the south, Oyo State and Osun State to the north, Ondo State to the east and the Republic of Benin to the west. Abeokuta is Ogun State's capital and most populous city; other important towns include Ijebu Ode, the former royal capital of the Ijebu Kingdom and Sagamu, Nigeria's leading kola-nut grower. Farming and trading are the major preoccupations of the people. The majority of the population are Christians and Muslims.

The state has a population of 3,751,140 based on the 2006 population census, and with a growth rate of 2.4%, the projected population for the year 2021 was 5,498,963.[9] Therefore, the total population of children under one year in Ogun state was 274,948.[9] There are 1520 health facilities across the 20 LGAs in Ogun State. Of this number, 90 % (1373) are Primary Healthcare facilities, 144 are Secondary Healthcare facilities, and 3 are Tertiary Healthcare facilities; all these facilities provide routine immunization services. The Primary Healthcare facilities are grouped into five (5) Health Zones: Egba, Ijebu, Ota, Remo, and Yewa.

Study Design

The study was a retrospective descriptive cross-sectional survey of vaccination records to determine immunization trends for five years (2017-2021) and three months (April-June) covering the lockdown period during Nigeria's COVID-19 pandemic. The records for all the 20 Local government areas in the state were examined.

Study Population

The study population comprised all children between the ages of 0 - 12 months who received vaccines at the PHC facilities in Ogun State and were recorded in the state vaccination register during the study period.

Sample Size and Sampling Technique

All records of children who received vaccination for the stated period in the state were accessed. Only records of infants 0-12 months who were vaccinated between 2017-2021 within three months under study (April-June) were included in the survey, while records of children who received vaccines that were not uniformly commenced in the NPI schedule during the study period were excluded.

Measurement

The parameter studied was the number of vaccine doses administered for the different periods.

Data collection and analysis

Data was extracted from the state immunization records using a proforma created on ODK (Open Data Kit) and subsequently analyzed using IBM® SPSS version 23.0. Descriptive statistics, such as frequencies, proportions, and line graphs, were used. The line graphs were drawn to examine the trends of the vaccination coverage rates before, during and after the pandemic. Also, the F-test was used to compare the means of vaccines administered across the years. The p-value was set at <0.05 significance level.

Ethical Consideration

Ethical approval for the study was obtained from the State Health Research Ethics Committee of the Ministry of Health, Ogun State (HPRS/381/392). Written permission to use the secondary data was also sought from the State Primary Health Care Development Agency.

RESULTS

There were variations in the uptakes of the different antigens in all the health zones over the years under review. Most of these changes in vaccine uptake were significant across all the Health zones except for Remo Hz, where none was significant. In these other Health Zones, there was a significant change in the uptake of all the antigens apart from BCG that was only significant in the Ijebu Hz ($P = 0.025$), where its uptake was highest in 2018 at 3583, from where it dipped spanning 2019 (2905) and 2020 (2806) after which it rose in 2021(3575) to near its peak at 2018.

Generally, for the other antigens (Measles, Penta 1, Penta 3), uptake rose between 2017-2019, fell in 2020 and rebounded in 2021. In Egba Hz, at its peak in 2019, Measles, Penta 1, and Penta 3 uptake respectively were 3124, 3392, and 3131; at its nadir

in 2020, they were 2525, 2939, and 2548 respectively; these numbers rose in 2021 to 2745, 3246 and 2813. Ijebu Hz had its peak for these antigens in 2018, apart from measles, which was still high in 2019 (3635, 3450, and 3212, respectively). Also, in 2020, all three antigens dipped to their lowest at 2723, 2786, and 2725 and began to rise in 2021 to 3354, 3517 and 3364.

In the Ota Hz, similar to Egba Hz, at its peak, uptake for the three antigens in 2019 was 5465, 5272, and 4930, respectively; it fell in 2020 to 4632, 4398, and 4001, after which it rose to 4643, 4438 and 4042 in 2021. Yewa followed the same pattern, at its highest before 2020, uptake for the three antigens were 2517, 2510, and 2375, respectively, fell in 2020 to 2230, 2178, and 2108, it then rose in 2021 to a peak of 2682, 2692 and 2544. Table 1

The coverage for BCG in all the health zones (Hz) except Egba Hz showed a decline in 2019 from the initial highs in the previous years, with all the zones having their lowest coverage in 2020 at the onset of the pandemic. However, the coverage gradually rose in 2021 in all the health zones except Ota Hz. Figure 1

In all the health zones, measles coverage was at its highest in 2019, with Ijebu Hz having the highest coverage at 104%. However, there was a sharp decline in coverage in all the zones in 2020 at the onset of the pandemic. The measles vaccine coverage rates for Egba, Ijebu, Ota, Remo, and Yewa Health zones for measles during the pandemic were 65%, 75%, 76%, 90%, and 73%, respectively, compared to the year before and the year after the pandemic. In addition, the chart showed a slow rise in coverage across four health zones (Egba, Ijebu, Remo and Yewa) in 2021. Figure 2

The trend showed that all the zones (Egba, Ijebu, Ota, Remo and Yewa) experienced a decline in the coverage rate for Penta 1 in 2020 during the pandemic (76%, 77%, 72%, 93% and 71%, respectively). Also, all the zones showed a rebound the following year except for Ota Hz, which declined further (71%). Figure 3

Penta 3 antigen coverage trend showed that all the zones experienced a decline in the coverage rate in 2020 during the pandemic (66%, 75%, 66%, 89% and 69%, respectively) compared to the preceding year. However, there was a rebound in all the zones in the following year except for Ota Hz, which showed a further decline (64%). Figure 4

The vaccine dropout rate (DOR) was high across all Health zones in 2017, apart from Yewa Hz, which had a DOR of 8.3%, and it consistently had low DOR throughout the years under review, having its lowest DOR (3.2%) in 2020. In contrast, Egba Hz had the highest DOR among the Health zones with a high DOR across all the years apart from 2019, when it had a DOR of 7.7%; its DOR was increasingly high in the years 2020 and 2021, and it was as high as 13.3% in 2020. Dropout rate across the other Health zones followed almost the same pattern with some slight variation; they had high DOR in 2017 with a subsequent drop in the following years, falling to a nadir of 1.9% in 2021 and 2.2% in 2020 in Remo Hz and Ijebu Hz respectively. Although in Ota Hz, it rose to as high as 9.0% in 2020 but fell back to 7.5% in the final year. Figure 5

Table 1: Vaccines Uptake according to the Health Zone (Hz)

Variables	BCG	Measles	Penta 1	Penta 3
Egba Hz				
2017	3231	2027	2147	1880
2018	3379	2312	2669	2366
2019	3633	3124	3392	3131
2020	3471	2525	2939	2548
2021	3977	2745	3246	2813
F - test	1.031	3.640	4.539	4.092
p - value	0.438	**0.044**	**0.024**	**0.032**
Ijebu Hz				
2017	3467	2996	3237	2890
2018	3583	3181	3450	3212
2019	2905	3635	3365	3203
2020	2806	2723	2786	2725
2021	3575	3354	3517	3364
F - test	4.454	7.785	4.500	4.299
p - value	**0.025**	**0.004**	**0.024**	**0.028**
Ota Hz				
2017	7402	4806	5156	4592
2018	7611	4997	5132	4919
2019	6717	5465	5272	4930
2020	6762	4632	4398	4001
2021	6679	4643	4438	4042
F - test	1.540	3.952	5.178	7.432
p - value	0.264	**0.035**	**0.016**	**0.005**
Remo Hz				
2017	3170	2516	2841	2547
2018	3122	2673	2840	2703
2019	3186	2843	2833	2698
2020	2990	2633	2738	2620
2021	3174	2849	2931	2858
F - test	0.541	1.796	0.902	2.211
p - value	0.710	0.206	0.498	0.141
Yewa Hz				
2017	2717	1924	2086	1913
2018	2970	2124	2161	2076
2019	2892	2517	2510	2375
2020	2873	2230	2178	2108
2021	3238	2682	2692	2544
F - test	2.644	10.326	6.403	6.120
p- value	0.097	0.001	0.008	0.009

F-one - ANOVA test; *p <0.05

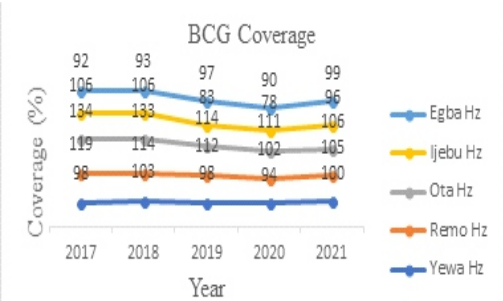

Figure 1- Trend in BCG Coverage

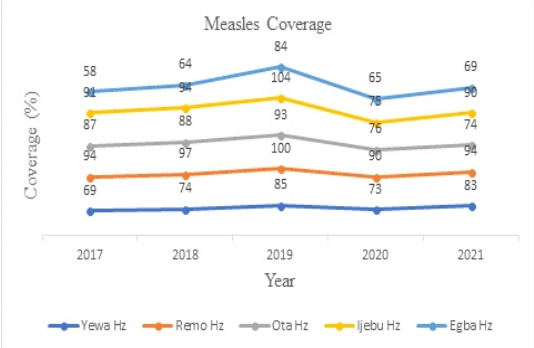

Figure 2- Trend in Measles Coverage

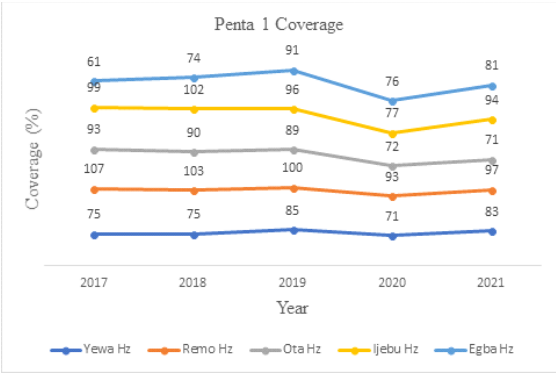

Figure 3 – Trend in Pentavalent 1 Coverage

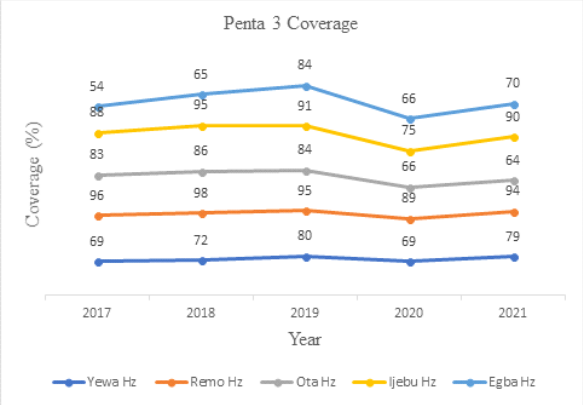

Figure 4 – Trend in Pentavalent 3 Coverage

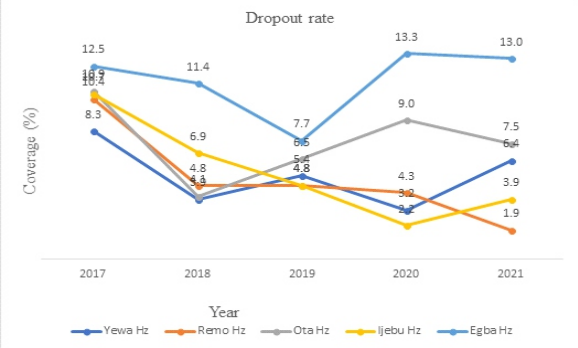

Figure 5- Trends in the Vaccine Dropout Rates across the Health Zones

DISCUSSION

The study assessed the impact of COVID-19 on Routine immunization services in Ogun State, Nigeria. Studies have revealed the disruption of preventive services and public health priorities that resulted from the effects of the COVID-19 pandemic, including routine vaccination programmes.[4,10] In this study, we found that the BCG coverage in all the health zones of the state except Egba Hz declined from a high point one year earlier and a slightly lesser level in 2019 to an all-time low during the pandemic. The rate went to an all-time low not previously recorded in the three years preceding the pandemic. This result agrees with a similar finding in the United States of America and another study in Nigeria.[5,11] A plausible explanation for these findings was the lockdown that restricted the movement of mothers and the disruption of vaccination services arising from the stay-at-home orders during the pandemic.[4] In addition to this explanation, it is also of note that many of the primary healthcare centres operated skeletal services, and some even closed in some parts of the country at the pandemic's peak, which could have resulted in a drop in vaccination coverage.[4,12] Furthermore, the sharp decline was probably due to COVID-19, considering the rise in coverage observed in the following year, 2021, as the pandemic started waning.

Similarly, our study found that the immunization coverage rates for other antigens, such as pentavalent vaccines 1 and 3, and the measles vaccines witnessed a downward trend in all the

health zones during the pandemic and may not be unlikely related to the earlier stated reasons. There was a fall in the proportion of children who received the vaccine for all the antigens between 2019-2021. This finding is corroborated by the World Health Organization (WHO) official data on the effect of COVID-19 on childhood vaccination, which reported a decline between 2019 and 2021 in the percentage of children who received three doses of diphtheria, tetanus and pertussis (DTP3) vaccine which is a marker for immunization coverage within and across countries.[7] Other studies also showed similar results, which are consistent with this study's findings.[11,13] However, other factors, such as absenteeism of healthcare workers and disruptions in the access and supply side of the immunization programme due to the lockdown measures, may have also contributed to the drop in the coverage rate of the vaccines. This finding implies that any significant reduction in the already poor vaccination coverage rate, as observed pre-pandemic, may lead to an outbreak of vaccine-preventable diseases such as polio and measles, as seen in the past.[4]

Our study further found significant differences in childhood vaccination uptake across the health zones of the state. The Ota health zone did better in BCG vaccination uptake than other health zones. However, regarding all other vaccine uptakes, the Yewa health zone performed poorly compared to all the different health zones. The finding is of concern as the poor performance of the Yewa Hz constitutes a potential risk for all the other health zones within the state due to possible outbreaks of vaccine-preventable diseases that can spread to neighbouring health zones that are already confronted with the burden of the weak health system and sub-optimally performing routine vaccination programme.

Regarding the vaccine dropout rate, the study found that the vaccine dropout rate showed a sudden increase in the year 2020 in at least two of the health zones, the Egba and Ota zones, but a decrease in the remaining three health zones, the Ijebu, Remo and Yewa zones. The dropout rate later increased in 2021 in Ijebu and Yewa health zones. This finding may have resulted from caregivers' apathy for vaccination services due to the disruption in vaccination services during the pandemic. Another study in the country reported a similar finding for the pre- and post-pandemic period.[5] Similarly, some other studies stated that the COVID-19 pandemic impacted the public's behaviour towards vaccination in countries overwhelmed by the pandemic.[14,15] As suggested in a study, the high dropout rate portends danger to child health as it can lead to increased morbidity and mortality from vaccine-preventable diseases.[16] Therefore, diligent monitoring of vaccine-preventable diseases to avert outbreaks is needed. In addition, initiating a routine vaccination catch-up programme is essential to improve the dropout rate that may long follow the interruptions in vaccination services due to the pandemic and simultaneously strengthen the routine vaccination services.

CONCLUSION/RECOMMENDATION

The study generally revealed a decline in the vaccination rate during the COVID-19 pandemic which may be ascribed to the containment measures that limited immunization service access and availability. Therefore, strategies to strengthen routine vaccination programmes and improve vaccination coverage are essential to prevent post-pandemic vaccine-preventable disease epidemics. Hence, the need for restoration of immunization services to pre-pandemic levels and immunization catch-up for children who missed immunization in order to achieve the Immunization Agenda 2030 targets.

Limitation

This study has its strength and limitation. The potential strength of the study is that it provided insight into how the routine immunization services were performed during the pandemic and, importantly, the likely effect post-pandemic. The study limitation is that inferences about causality cannot be made since we used aggregated data that did not differentiate between socio-demographic factors. Thus, it is not possible to establish connections between variables.

Acknowledgement

The authors wish to appreciate the Ogun State Primary Health Care Development Board (OGPHECADEB) for granting the research team

access to the immunization data for the state.

Funding: The authors received no research funding.

Conflict of Interests: There is no conflict of interest.

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