African Journal of Research in Medical and Health Sciences
https://doi.org/10.71921/ajrmhs.vol4no1.89

RESEARCH *Open Access*

CHILDHOOD IMMUNISATION COVERAGE AMONG HEALTH FACILITY ATTENDEES IN RIVERS STATE, NIGERIA: DID THE COVID-19 PANDEMIC HAVE ANY IMPACT?

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Abstract

Background: Despite efforts, under-five immunisation coverage varies widely within and outside Nigeria, highlighting the need for regular data reviews to guide improvements.

Methods: This review analysed data from 534 health facilities in Rivers State, Nigeria, from January 2019 to December 2023, presenting findings in tables and charts.

Results: Coverage for BCG decreased from 91.3% in 2019 to 71.1% in 2023 and was lowest in 2021. OPV coverage also declined, with OPV0 dropping from 59.1% to 46.6% and OPV3 from 91.7% to 71%. Coverage for 3 doses of Pneumococcal, Pentavalent, and Measles vaccines declined, and full immunisation dropped from 62.7% to 42.8%.

Conclusions: Despite not reaching global and national targets, immunisation rates declined during and after the COVID-19 pandemic, which impacted access to health services. Efforts such as awareness campaigns, training, and logistics management were employed to mitigate disruptions. The data underscores the need for strategies to improve vaccine coverage and reduce childhood morbidity and mortality from preventable diseases.

Keywords: *Immunisation coverage, childhood vaccination, COVID-19 pandemic*

Cite as*: Atata CT, Ikurayeke J, Jaja ID, Oreh AC, Uriah S, Nte A Urang IJ. Childhood Immunisation Coverage Among Health Facility Attendees in Rivers State, Nigeria: Did the Covid-19 Pandemic Have Any Impact? AJRMHS 2026; 4(1): 32 - 40*

Introduction

Immunisation is a crucial aspect of public health that has reduced child morbidity and mortality from vaccine-preventable diseases.[1] It is the process of making an individual immune or resistant to a particular disease, thereby reducing its transmission risk. Immunisation dates back to ancient civilisations, when people observed that exposure to mild forms of diseases protected against more severe forms.[2] The development of vaccines began in the late 18th century with Edward Jenner's smallpox vaccine, which marked the beginning of a new era in disease prevention.[2] The administration of a vaccine is a cost-effective process for protecting vulnerable populations from life-threatening infectious diseases.[2] Thus, the World Health Organisation(WHO) in 1974, established the Expanded Programme on Immunisation (EPI) to ensure that all children have access to routine immunisation thereby reducing the morbidity and mortality from the six initial target vaccine-preventable diseases.[3] However, the scope of diseases covered by immunisation has continued to increase reflecting the crucial role of universal immunisation of children against common vaccine-preventable diseases in reducing infant and child morbidity and mortality.[4] Immunisation is an essential, cost-effective strategy. According to the WHO, children are fully immunised when they have received a dose of the Bacillus Calmette Guerin (BCG) vaccine, four doses of the Oral Polio Vaccine(inclusive of the birth dose), inactivated polio vaccine (IPV), three doses of pentavalent vaccine (consisting of Diphtheria, Pertussis, Tetanus toxoid, Hepatitis B, and *Haemophilus influenza* type b vaccines), two doses of the Measles-Containing Vaccine (MCV) and a dose of the Yellow Fever (YF) vaccine.[4] Additional vaccines are introduced into the national schedules based on national needs. Thus, the Nigerian National Policy on immunisation includes several essential vaccines to protect against preventable diseases and is regularly updated.[5] Some of the key vaccines administered include; BCG, OPV or IPV which prevents poliomyelitis, pentavalent vaccine which protects against five childhood diseases; diphtheria, tetanus, pertussis (whooping cough), hepatitis B and *Haemophilus influenza* (Hib) type b, measles vaccine, yellow fever vaccine, pneumococcal conjugate vaccine (PCV), meningococcal vaccine and the rota virus vaccine introduced in 2022 and the Measles-Rubella Vaccine and malaria vaccine introduced in 2025.[4] The human papilloma virus vaccine has also been added for girls aged 9 years.

Immunisation coverage is a crucial indicator of health system performance and child health outcomes. Globally, immunisation coverage varies across regions, with higher rates in the Western Pacific and Europe compared to Africa and South-East Asia.[6] According to the World Health Organisation, vaccine coverage rates in many lower and middle-income countries (LMIC) fall short of the target of 90 % national coverage with three doses of diphtheria-tetanus-pertussis containing vaccines (DTP3).

The coverage in Nigeria faces significant challenges, with about 60% of children not fully immunised based on the 2024 Nigeria Demographic Health Survey (NDHS).[4] While South-South had 36.4% children fully vaccinated according to the national schedule with Rivers State having 29.3% children vaccinated for 12 – 23 months of age.[4] Increasing coverage is key to reducing preventable deaths and ensuring a healthier future for the nation. The immunisation status of children is dependent on the dynamics of vaccination uptake, which is complex and involves the interplay of different associated factors. Thus,

immunisation status varies widely in different parts of Nigeria despite efforts to improve the services. Thus, achieving high childhood immunisation coverage has remained a significant challenge in Nigeria and a critical focus for health organisations, including the WHO and UNICEF.[7]

The COVID-19 pandemic affected health care services, especially among children. Rivers State was on different levels of lockdown during this period, and this had an impact on activities in the State, including economic, social and health care delivery. A study by Tagbo et al on the Impact of the COVID-19 pandemic on immunisation services in Nigeria revealed that the pandemic and its mitigation measures affected immunisation services in terms of demand or access (physical and economic), services and logistics, with an overall drop in coverage and rise in dropout rates.[8] In Rivers State, immunisation services were disrupted by the lockdown, as transportation, vaccine logistics, and staff and patient movement were not readily available.

Rivers State, the site of this study, is one of the 36 States in Nigeria with an estimated population in 2022 of 7,476,800 people, which is 4% of the Nigerian population, with those below the age of 15 years constituting 36% of the population.[9] In the State, the Rivers State Primary Health Care Management Board (RSPHCMB) implements various initiatives to improve immunisation coverage, such as Maternal, Newborn and Child Health Weeks, Community outreach programmes, monitoring and evaluation programmes, etc. It partners with non-governmental organisations, such as the WHO, UNICEF and others to ensure optimal immunisation services, including supplying consumables, logistics, and publicity. These were disrupted during the pandemic. The DHIS2 platform is used for monitoring healthcare service provision in all States in Nigeria and it informs data-driven performance management in health facilities in Nigeria, especially in the Primary Health care facilities. This study aims to provide a review of immunisation data of children who visited selected health facilities in Rivers State, South-South, Nigeria from 1st January 2019 – 31st December 2023 to assess the impact of the COVID-19 pandemic on the services.

Methods

Rivers State immunisation data domiciled in the District Health Information System 2 (DHIS) platform in the Health Management Information System was extracted for a period of five years to review the under-five immunisation coverage.[10] One thousand and forty-eight health facilities in the State were listed on the DHIS platform, among which 534 provided immunisation data. Data from these facilities were extracted for analysis of their immunisation coverage rates for the period January 2019 to December 2023. They were analysed using the IBM SPSS Statistics (Version 21.0) and presented as frequencies and percentages in tables and charts.

Results

The coverage for Bacillus Calmette-Guérin (BCG) from 2019 to 2023 (Figure 1) showed that the rate declined from 91.3% in 2019 to the lowest (69.6%) in 2021 and rose to 71.1% in 2023.

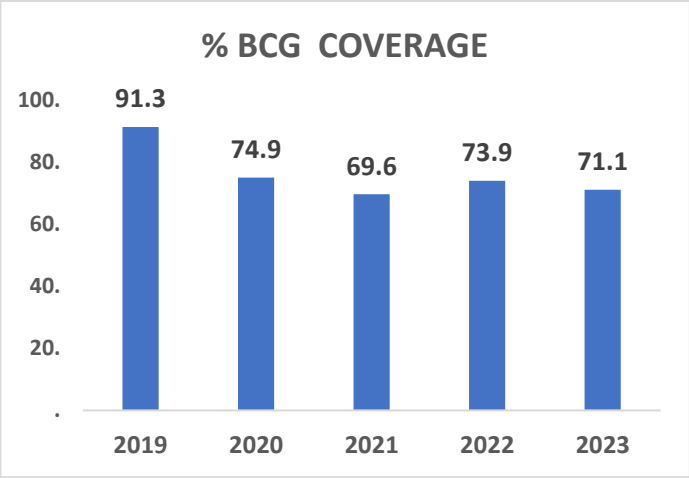

Figure 1: BCG Coverage 2019- 2023

The Oral Polio virus vaccine (OPV) coverage was also highest for all doses in 2019, reached the lowest in 2022 and started rising in 2023 (Fig.2).

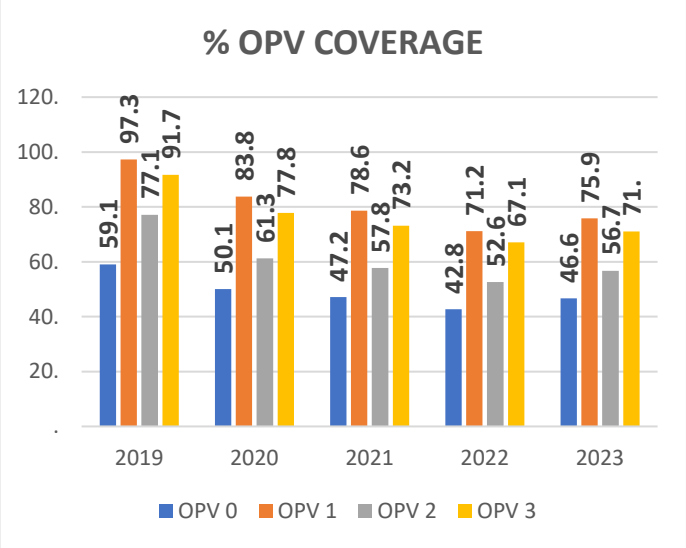

Figure 2: Oral Polio Vaccine Coverage from 2019 – 2023

Similarly, the coverage for the relatively new vaccine addition, the Inactivated Polio vaccine, was highest in 2019 at 86.4% for IPV1, declined to the lowest (63.1%) in 2021 before rising to 73.3% in 2023(Figure 3).

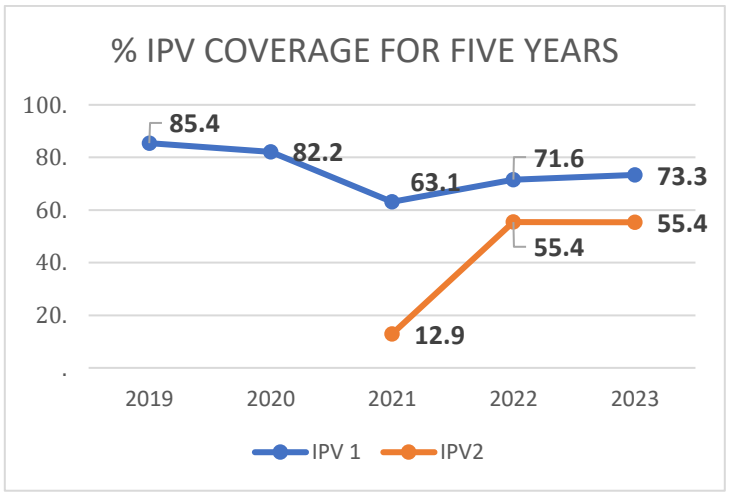

Figure 3: Inactivated Polio vaccine Coverage 2019 – 2023

The pentavalent vaccine coverage over the 5 years under review was similarly highest in 2019, with penta1 (97.4%), penta2 (71%) and penta3 (91.3%) (Figure 4) reached the lowest rates in 2021 and started rising slowly in 2023.

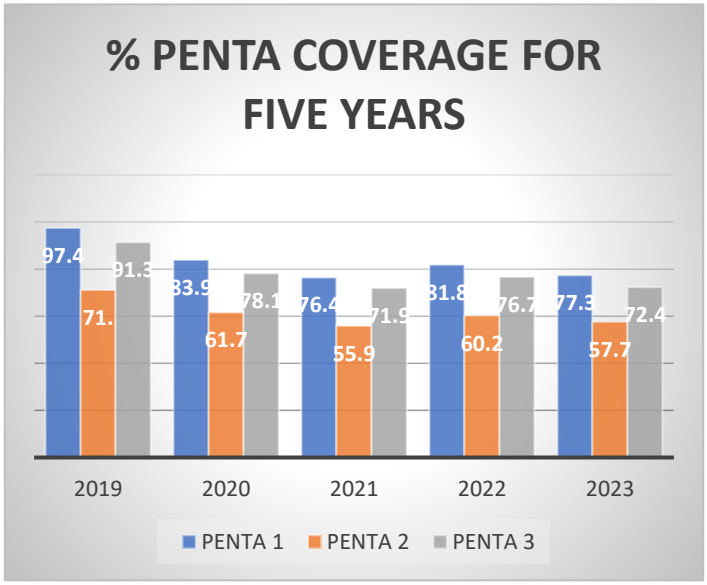

Figure 4: Pentavalent Vaccine Coverage from 2019-2023

Figure 5 shows the Pneumococcal Conjugate vaccine (PCV) coverage from 2019 – 2023. The highest coverage

was in 2019 (PCV1(97.9%), PCV2(90.9%) and PCV3(70.7%) and they have continued to decline to 2023

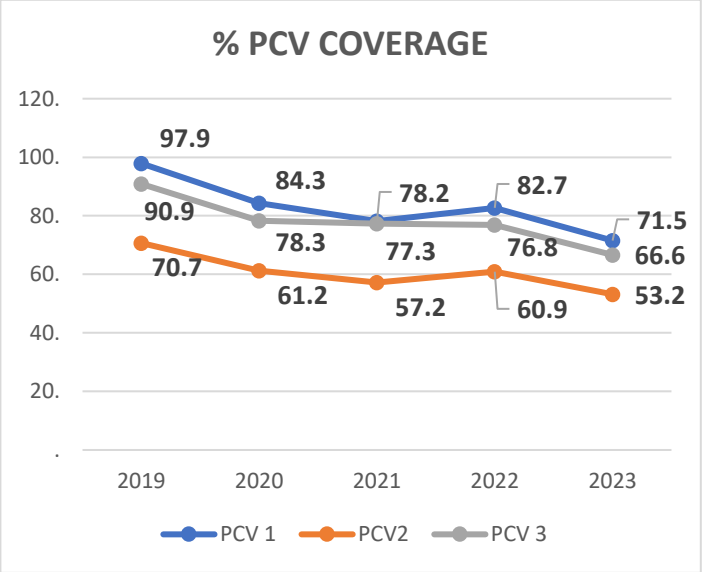

Figure 5: Pneumococcal Conjugate Vaccine Coverage from 2019 - 2023

The highest coverage of measles-containing vaccine 1 (MCV1) was in 2019 (87.3%), but declined to the lowest in 2021, with a coverage of 64.3%. Although the rate rose to 72.2% in 2022, it further declined to 65.1% and has not been able to reach the 2019 pre-COVID 19 rate (Figure 6).

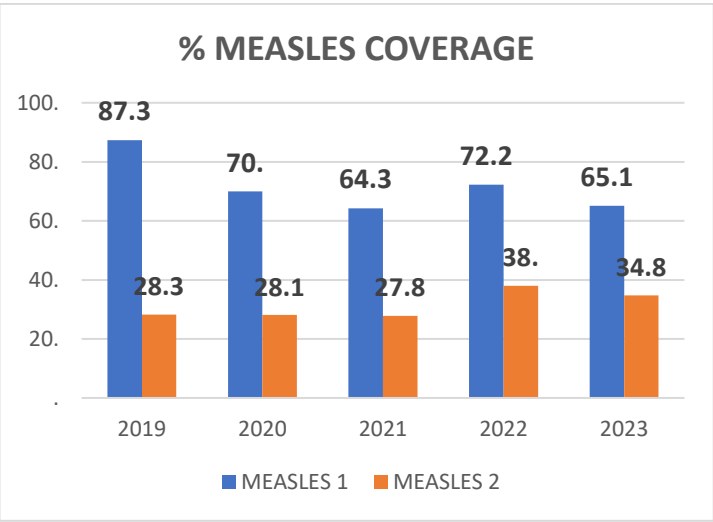

Figure 6: Measles Coverage from 2019 – 2023

The immunisation coverage for children less than 1 year of age was highest in 2019 (62.7%), followed by 47.2% in 2022 (Figure 7).

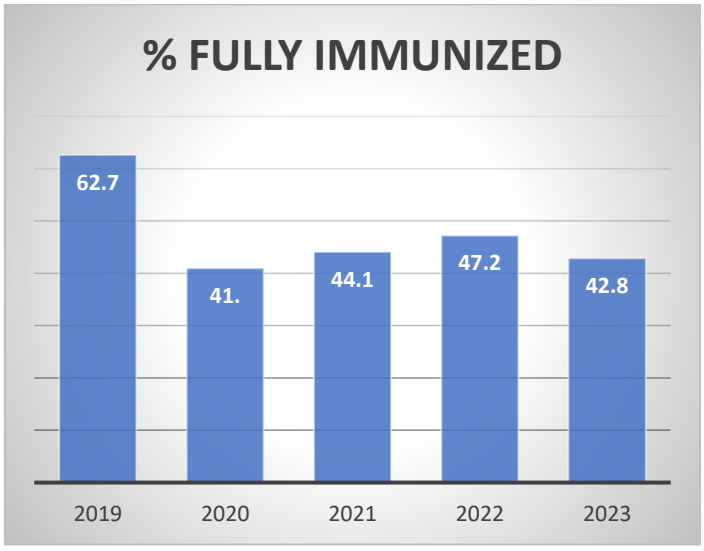

Figure 7: Immunisation Coverage for Children less than 1 year 2019-2023

Thus, the highest coverage rates for Penta3 (91.3%), measles (87.3%) and full immunisation (62.7%) were in 2019 (Figure 8).

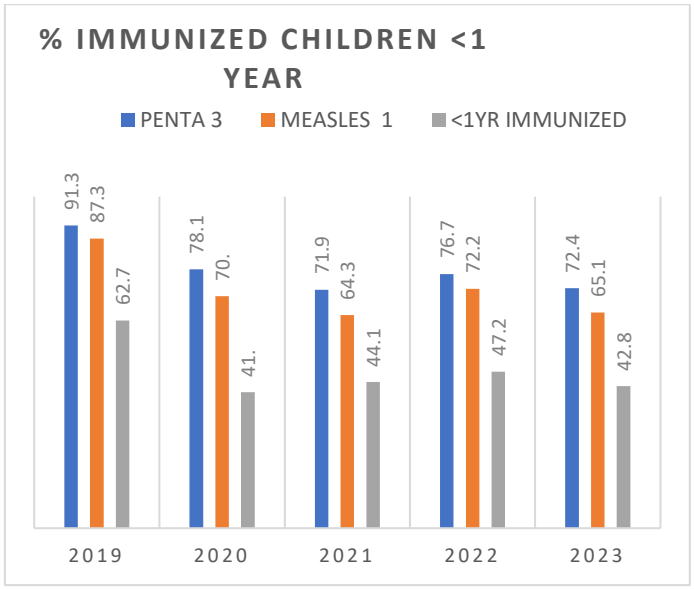

Figure 8: Vaccine coverage rates for various antigens in children below 1 year of age

Discussion

The findings of this study revealed that the highest coverage rate for all the antigens was for BCG in 2021, and this was similar to the findings of a study by Temitayo-Oboh et al at a tertiary hospital in South-western Nigeria, which showed the highest coverage among the vaccines as 74.9% for BCG.[11] The 2024 Nigeria Demographic and Health Survey[4] reported a BCG coverage rate of 67% for children aged 12 – 23 months, with 65% having received 1st dose of oral polio vaccine, while 63% received 1st dose of DPT-HepB-Hib. According to studies in West Africa, BCG immunisation also has beneficial non-specific effects (NSE) other than protecting the child from tuberculosis infections, and the earlier it is given to infants, the higher their chances of survival.[4]

The coverage rates for polio vaccines in this study were similar to those from a study in sub-Saharan Africa that reported OPV1, OPV2, and OPV3 coverage rates among children aged 12-23 months to be 86.59%, 81.27%, and 68.41%, respectively.[12] However, in 2023, 83% of infants around the world received 3 doses of polio vaccine in contrast to the situation in this study of the coverage rates of OPV_0 46.6%, OPV1 75.9%, OPV2 58.7%, OPV3 71%, which was lower.[13]

The decline in the pentavalent immunisation coverage rates reported in this study is similar to the findings from a study by Linda et al on a 6- year trend on pentavalent vaccination in Imo State.[14] It showed a decline in vaccination coverage in 2020-2021 that may be attributed to the COVID-19 pandemic, and the drop in 2023 may be attributable to reduced funding of outreaches and rising state of insecurity in the state.[14] This downward trend was also seen in our study in Rivers State, which showed a decline in the immunisation coverage from 2019 over the years, with only slight improvement in between the years. Tagbo et al revealed that the impact of the COVID-19 pandemic affected physical, economic and other services delivery in the State, including logistics for immunization services, with an overall drop in coverage and rise in dropout rates.[7] In Rivers State, immunization services were disrupted by the lockdown since transportation, logistics of vaccines, staff and patients were not readily available. This gradual decline could also be due to the COVID-19 pandemic and the residual effects. Included in the residual effects are the reduction and lack of outreaches.

The Pneumococcal Conjugate vaccine (PCV) coverage rates of 2019 (97.9% PCV1 and 70.7% PCV3) were higher than the findings from a Chinese study which reported a coverage of PCV of 50.61% in 2019 and that of the global coverage of basic immunisation estimated to be 48% in 2019 according to WHO following Pneumococcal conjugate vaccines usage in 149 countries or regions around the world.[15] In another study in Southern Europe, PCV vaccination coverage was suboptimal, despite its proven public health benefits. The high coverage rate noted in this study compared to the findings in other regions could be due to the massive sensitisation and campaign during the maternal, neonatal and child health weeks and other massive immunization programs, including the measles campaign and others in Rivers State.

The coverage of measles-containing vaccines was similar to that in a 2023 study, which showed that about 83% of children received a dose of MCV1 by their first birthday, and 74% received 2 doses of the vaccine.[13] Similarly, the decline in vaccine coverage reported in this study was noted in the African regional study with the measles vaccine

coverage declining from 71% in 2019 to 70% in 2020, before fluctuating between 68% in 2021 and 69% in 2022.[16] The decline in immunisation coverage seen in this study could be attributed to the disruption of protective services during the COVID-19 pandemic (irregular outreach funding). This disruption in services could also explain the decline in immunisation coverage of most of the vaccines in this study between 2020 and 2021. According to the WHO, the number of children who were not immunised against measles worldwide increased 15% from 19.3 million to 22.2 million from 2019 to 2023.[5] Children less than 1 year of age that were immunized, was highest in 2019 (62.7%) and (47.2%) 2022 which differs from the 90% immunisation coverage rate of children aged 12-24 months with higher rates in female children reported from a study in rural South Kerala, India.[17] Similarly, it aligns with the reports of Bobo FT and colleagues who reported that some sub-Saharan African countries had small differences in the vaccination uptake, with more than 77% of children being fully immunised in Ghana, Burundi, and Rwanda, with a coverage was <40% in Ethiopia, Nigeria, Angola, Chad, and Guinea. The highest full vaccination coverage was in Rwanda (93%), while Guinean children had the lowest coverage of full vaccination (24%).[18]

Taglo et al in their study found that the effect of the COVID-19 lockdown was public fear and panic among the citizens of Nigeria.[8] Health workers faced numerous challenges, including gaps in knowledge, attitude and practice, and this put them at risk of infection.[19] This disrupted healthcare services, with irregular provision of personal protective equipment (PPE).[19] The Government, in collaboration with all stakeholders in the health sector, instituted positive messages on immunisation and other public health issues following reports of outright rejection of vaccine uptake.[8] A study by Hilary et al showed that integrating immunisation into COVID-19 vaccination increased overall vaccine coverage.[20] This also increased vaccine coverage among zero-dose children and women attending antenatal and postnatal services.

Conclusion

The failure to attain targeted coverage rates for various vaccines and the declining coverage rates reported in this and other studies highlight the need to prioritise immunisation services and address potential challenges associated with vaccine development and deployment, to optimise child health, growth and development in Rivers State, Nigeria and various low- and middle- income countries. The COVID-19 pandemic had a profound effect on the health system, with emphasis on health workers' education, vaccination and staff logistics management in reference to immunisation services. Awareness creation among the populace cannot be overemphasised. Continued investment in vaccine research, development, and distribution is essential to protecting public health and preventing infectious diseases.

Strengths And Limitations

A major strength of this study is that it used health data that was readily available on the DHIS 2 platform in the state. However, the sociodemographic characteristics were not captured in our data source, and therefore, the full extent of immunisation needs in the population was not exhaustive. This would have helped tailor recommendations based on the differences observed. Data quality limitations were an issue, with only about 50% of the health care facilities providing immunisation services in the state having their data captured on the DHIS 2 platform.

Ethical Considerations

Ethical Approval was obtained from the Rivers State Research and Ethics Committee, RSHMB/RSHREC/2024/119.

Recommendations

Concerted efforts should be put in not only to stop the decline in coverage rates but to improve the immunisation coverage in the State by awareness creation on its benefits. There is a need to tackle concerns about immunisation hesitancy and misinformation. Also, to accelerate the coverage to ensure optimal impact on target diseases and the growth and development of children, and to minimise the impact of emergencies such as the COVID-19 pandemic on child health services. There is a need for support in vaccine research and development to address emerging infectious diseases.

Conflict of Interest – Nil

Contributions of Each Author:

All the authors were involved at different stages of the study; literature review, data collection, results, discussion and proofreading.

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Date Submitted: 16th December 2025

Date Accepted: 22nd February 2026

Date Published: 31st July 2026

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