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Original Research Article

Immunization Coverage and Dropout Rates among Children Aged 0–23 Months at a Tertiary Hospital in North-Central Nigeria: A One-Year Retrospective Study

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Abstract: Immunization remains one of the most cost-effective public health interventions for reducing childhood morbidity and mortality. The aim of the study was to assess the immunization coverage and dropout rates among children aged 0–23 months attending a tertiary hospital in Otukpo, Benue State, Nigeria. A retrospective descriptive study reviewed routine immunization data extracted from the National Health Management Information System (NHMIS) register from January to December 2021 at the Federal University of Health Sciences Otukpo Teaching Hospital (FUHSO-TH). Data were collated and analyzed using descriptive statistics to determine frequencies, coverage percentages, and dropout rates. A total of 1,344 records were analyzed. The mean immunization coverage across all scheduled vaccines was 77.9%. The Bacillus Calmette-Guérin (BCG) vaccine had the highest coverage (87.9%), while the second dose of the Measles-Containing Vaccine (MCV2) had the lowest (65.4%). The highest dropout rate occurred between BCG and MCV1 (18.1%), followed by MCV1 and MCV2 (9.2%). The study concluded that, while early infant vaccine uptake is encouraging, overall immunization coverage remains suboptimal and falls short of the WHO 90% target. Strengthening community sensitization, defaulter tracking, and implementing reminder systems are essential to improve coverage, particularly for vaccines administered later in infancy.

Keywords: Immunization Coverage, Vaccine Dropout Rate, Zero-Dose Children, Routine Immunization, Nigeria Demographic and Health Survey (NDHS), Benue State.

INTRODUCTION

Immunization is undeniably one of the most effective strategies for preventing vaccine-preventable diseases (VPDs) and reducing childhood mortality. Globally, the World Health Organization (WHO) and UNICEF target a minimum of 90% national coverage for all routine childhood vaccines [1, 2]. However, achieving this target remains a significant challenge. The 2024 WHO/UNICEF Immunization Coverage Estimates reveal that while global childhood

vaccination rates are gradually recovering from pandemic disruptions, significant gaps persist, especially in Sub-Saharan Africa [2]. The 2024 State of the World's Children report further emphasizes that climate shocks, demographic transitions, and economic inequalities continue to disproportionately restrict healthcare access for children in the poorest regions [3].

In Nigeria, despite the provision of free vaccination services, routine immunization coverage remains persistently below national and global targets. The recently released 2023–24 Nigeria Demographic and Health Survey (NDHS) underscores stark regional disparities, with northern geopolitical zones frequently reporting higher zero-dose prevalence and lower complete immunization rates compared to southern zones [4, 5]. Recent 2024 ecological trend analyses further demonstrate that geographical inequities in DTP (Diphtheria, Tetanus, and Pertussis) coverage and dropout rates are widening across the country [6].

In Benue State, located in Nigeria's North-Central geopolitical zone, immunization service delivery is often hampered by infrastructural deficits, hard-to-reach agrarian communities, and varying levels of caregiver education [7, 8]. Specifically, in Otukpo Local Government Area—the host of the Federal University of Health Sciences Otukpo Teaching Hospital (FUHSO-TH)—there is a pressing need to continuously evaluate localized vaccine uptake to inform regional health policies [9]. This study aimed to assess the immunization coverage patterns and dropout rates among children aged 0–23 months attending FUHSO-TH, providing updated, localized data to strengthen regional immunization frameworks.

MATERIAL AND METHODS

Study Design and Setting

A retrospective, facility-based descriptive study was conducted at the immunization clinic of the Federal University of Health Sciences Otukpo Teaching Hospital (FUHSO-TH), located in Otukpo, Benue State, Nigeria. FUHSO-TH serves as a major referral center for the Otukpo Local Government Area and surrounding agrarian communities.

Study Population and Data Collection

The study population comprised all children aged 0–23 months who received routine immunization services at the facility between January and December 2021. Secondary data were extracted from the National Health Management Information System (NHMIS) routine immunization registers. Extracted variables included the child's age, sex, maternal educational status, and the specific vaccines received.

Data Analysis

Data were collated and analyzed using descriptive statistics to determine frequencies, coverage percentages, and dropout rates. Coverage was calculated as the percentage of children receiving a specific vaccine out of the total study population (N = 1,344). Dropout rates were calculated by determining the percentage difference between the number of children who started a specific vaccine interval and those who completed it.

RESULTS

A total of 1,344 children were included in the study. The overall mean immunization coverage across the assessed vaccines was 77.9%. The socio-demographic characteristics, vaccine coverage rates, and dropout rates are detailed in the subsequent sections.

Socio-Demographic Characteristics

Table 1 presents the socio-demographic distribution of the children by sex. Out of the 1,344 children included in the study, there was a slightly higher proportion of males, who constituted 51.3% (n = 690) of the study population, compared to females at 48.7% (n = 654).

Table 1: Distribution of Children by Sex (N = 1,344)

Sex	Frequency	Percentage (%)
Male	690	51.3
Female	654	48.7
Total	**1,344**	**100.0**

Table 2 details the age distribution of the study participants. The largest proportion of children fell within the 6–11 months age bracket, accounting for 29.0% (n = 390) of the total population. This was followed by the 12–17 months age group at 27.7% (n = 372), while infants aged 0–5 months represented the smallest cohort at 20.8% (n = 280).

Table 2: Distribution by Age Group (N = 1,344)

Age Group (Months)	Frequency	Percentage (%)
0–5	280	20.8
6–11	390	29.0
12–17	372	27.7
18–23	302	22.5
Total	**1,344**	**100.0**

The educational status of the mothers is summarized in Table 3. A significant majority of the mothers had attained a secondary level of education, representing 43.0% (n = 578) of the cohort. Furthermore, nearly a third (32.7%, n = 440) had completed tertiary education, whereas a small minority of 7.0% (n = 94) reported having no formal education.

Table 3: Mothers' Educational Status (N = 1,344)

Education	Frequency	Percentage (%)
No Formal Education	94	7.0
Primary	232	17.3
Secondary	578	43.0
Tertiary	440	32.7
Total	**1,344**	**100.0**

Vaccine Dropout Rates

Table 4 highlights the vaccine dropout rates across different critical immunization intervals. The most substantial attrition occurred between the administration of the BCG vaccine and the first dose of the measles-containing vaccine (MCV1), recording a high dropout rate of 18.1%. The dropout rate between Pentavalent 1 and Pentavalent 3 was 8.6%, while the transition from MCV1 to MCV2 saw a 9.2% dropout rate.

Table 4: Vaccine Dropout Rates

Vaccine Interval	Number Started	Number Completed	Dropout Rate (%)
BCG → MCV1	1,182	968	18.1
Pentavalent 1 → Pentavalent 3	1,128	1,031	8.6
MCV1 → MCV2	968	879	9.2

Annual Immunization Coverage Rates

The annual immunization coverage rates for specific vaccines are outlined in Table 5 and visualized in Figure 1. The Bacillus Calmette-Guérin (BCG) vaccine achieved the highest coverage at 87.9% (n = 1,182), closely followed by the zero-dose oral polio vaccine (OPV0) at 86.3% (n = 1,160). Conversely, coverage progressively declined for vaccines administered later in infancy, with the second dose of the measles-containing vaccine (MCV2) recording the lowest uptake at 65.4% (n = 879).

Table 5: Annual Immunization Coverage Rate of Vaccines (N = 1,344)

Vaccine	Frequency	Coverage (%)
BCG	1,182	87.9
OPV0	1,160	86.3
Pentavalent 1	1,128	83.9
Pentavalent 2	1,082	80.5
Pentavalent 3	1,031	76.7
MCV1	968	72.0
Yellow Fever	950	70.7
MCV2	879	65.4

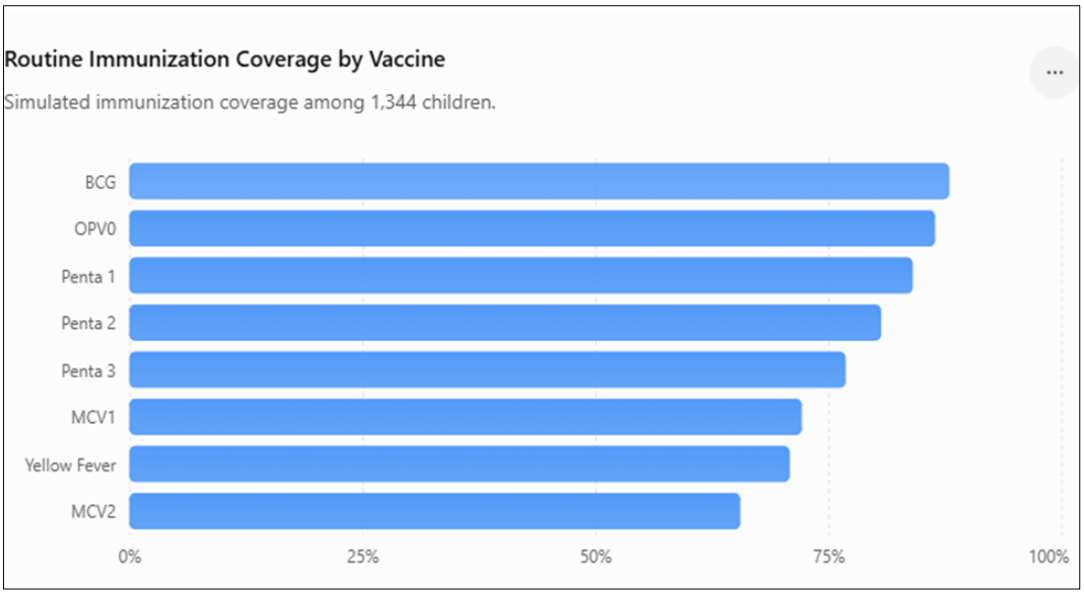

Figure 1: Immunization Coverage Rate by Vaccine Type

This bar chart illustrates the progressive decline in vaccine uptake among the study population (N = 1,344) from birth vaccines (BCG, OPV0) to later infancy doses (MCV1, MCV2).

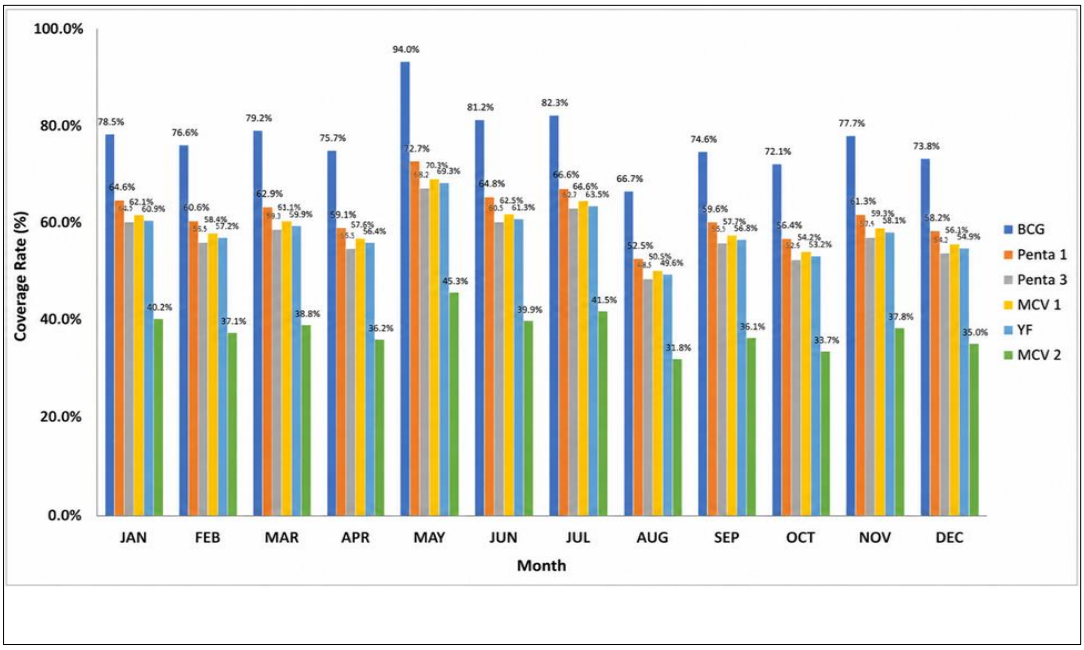

Figure 2: Monthly Immunization Coverage Rates

This line graph demonstrates the fluctuations in overall immunization coverage over the 12-month study period (January to December), highlighting seasonal variations in health facility attendance.

DISCUSSION

This study evaluated routine immunization coverage and dropout rates at a major tertiary health facility in Otukpo, Benue State. The overall mean immunization coverage among children aged 0–23 months was 77.9%. While this exceeds the historical benchmarks seen in previous years, it remains considerably below the 90% coverage target mandated by the WHO for robust global and regional childhood protection [1, 2].

Globally and across Africa, early infant vaccines typically record the highest uptake. In this study, the BCG and OPV0 vaccines had the highest coverage rates (87.9% and 86.3%, respectively), representing a strong baseline of initial health-seeking behavior. This high early coverage is largely attributed to their administration immediately after birth,

capturing mothers and newborns before hospital discharge. The 2023–24 NDHS and recent independent cross-sectional surveys strongly correlate facility-based, skilled-attendant deliveries with significantly higher immediate postnatal vaccine uptake in Nigeria [4, 5].

However, as distinctly illustrated in Figure 1, a progressive and concerning decline in coverage was observed for subsequent vaccines scheduled later in infancy. Pentavalent 1 coverage stood at 83.9%, dropping steadily to 76.7% for Pentavalent 3. This resulted in a Pentavalent 1 to Pentavalent 3 dropout rate of 8.6%. While this falls just under the WHO's maximum acceptable dropout threshold of 10% [10], it reflects a worrying trend of incomplete primary series. The context of these dropouts is further illuminated by the monthly immunization trends depicted in Figure 2. The noticeable fluctuations in coverage rates throughout the year likely mirror seasonal and socio-economic shifts. In Benue State, and specifically the agrarian setting of Otukpo, attrition is commonly driven by seasonal farming demands, where caregivers' availability diminishes during peak planting or harvesting periods [7-11]. When coupled with transportation costs and sporadic vaccine stock-outs, continuity of care suffers. Recent 2024 literature confirms that these geographical and seasonal barriers are primary drivers of "zero-dose" and under-immunized children in Nigeria's North-Central region [5, 6].

The most severe gaps, visually emphasized by the steep drop-off at the right tail of Figure 1, were observed in the uptake of measles-containing vaccines (MCV). MCV1 coverage was 72.0%, dropping to 65.4% for MCV2, yielding a dropout rate of 9.2% between the two doses. Furthermore, the overall dropout rate from BCG entry to MCV1 was a striking 18.1%.

According to the WHO's 2024 global estimates, measles remains highly transmissible, requiring at least 95% coverage with two doses to effectively prevent fatal outbreaks [12]. The long interval between early infant vaccines and the administration of MCV1 (at 9 months) and MCV2 (at 15 months) frequently leads to missed appointments. Many caregivers operate under the misconception that the immunization schedule concludes after the 14-week Pentavalent series [13, 14].

Overall, our findings corroborate recent national data demonstrating that while initial health-seeking behavior for immunization at FUHSO-TH is strong, retaining mothers in the care continuum over the child's first two years remains a formidable hurdle.

CONCLUSION

Immunization coverage among children aged 0–23 months at FUHSO-TH, Otukpo, is suboptimal, characterized by significant dropout rates for vaccines administered later in infancy. The failure to meet the 90% WHO target leaves a vulnerable subset of children at risk for diseases like measles. To bridge this gap, targeted interventions are urgently required. Strengthening community sensitization to educate mothers on the complete 15-month schedule, implementing active defaulter tracing, and utilizing SMS-based appointment reminder systems are highly recommended strategies to improve retention and offset seasonal attendance drops.

DECLARATIONS

Ethics Approval and Consent to Participate: Ethical clearance for the use of secondary data was obtained from the Health Research Ethics Committee of the Federal University of Health Sciences Otukpo Teaching Hospital. Data were anonymized to ensure confidentiality.

Availability of Data and Materials: The datasets analyzed during the current study were available from the corresponding author on reasonable request.

Competing Interests: There were no competing interests.

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