Socio-demographic Determinants of Childhood Immunisation in Egbedore LGA, Osun State, Nigeria

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ABSTRACT

Immunisation is vital for global child health, preventing an estimated 2–3 million deaths each year. However, vaccination coverage remains inadequate in many rural areas, including Nigeria, where barriers related to system, socioeconomic status, and cultural beliefs continue to affect uptake. In Egbedore Local Government Area (LGA) of Osun State, previous estimates have indicated immunisation coverage below the World Health Organization (WHO) recommended threshold of 80%, thus necessitating a focused investigation. The study aimed to investigate tSocio-demographic Determinants of Childhood Immunisation in Egbedore LGA, Osun State, Nigeria. A cross-sectional descriptive survey was carried out using the WHO's cluster sampling method. Data were gathered from 327 eligible participants via a structured, WHO-adapted questionnaire, and analyzed using chi-square tests at a 5% significance level. Ethical approval was granted by the relevant institutional review boards. The study found that 60.9% of female and 54.9% of male children were fully immunised. Although gender was not significantly related to immunisation status (p = 0.265), other factors showed significant associations. These included maternal age (p = 0.039), maternal education (p < 0.001), maternal occupation (p = 0.035), father's education (p = 0.003), household income (p = 0.001), and the number of children under five in the household (p = 0.007). Full immunisation rates were highest among children of mothers aged 25–34 years, with tertiary education, formal jobs, and in families with higher incomes and fewer young children. The immunisation uptake in Egbedore LGA is influenced by various sociodemographic factors, with maternal education, economic status, and family size being particularly significant. Despite equitable access across genders, structural obstacles need to be addressed to achieve

universal immunisation coverage. It was recommended that it is crucial to implement targeted, community-based interventions—such as maternal health education, male involvement, mobile outreach services, and conditional cash transfers—to enhance vaccine uptake. Additionally, improving health system infrastructure and employing culturally relevant communication strategies will be vital for advancing equitable immunisation coverage in rural Nigeria.

INTRODUCTION

Immunisation is fundamental to primary healthcare and a vital strategy for improving child survival in developing countries, preventing an estimated 2–3 million deaths globally each year (Biset et al., 2021). Vaccines combat diseases such as measles, polio, diphtheria, and pneumonia—significant contributors to child mortality in low- and middle-income countries (WHO, 2024). Despite substantial achievements, 1.5 million child deaths due to vaccine-preventable diseases occurred in 2024, predominantly in Sub-Saharan Africa. Challenges in achieving high immunisation coverage in rural and underserved areas include limited access, financial barriers, sociocultural beliefs, and health system deficiencies. Research indicates that maternal knowledge influences immunisation practices; for instance, Yibelta et al. (2022) found that only 48.1% of mothers in Ethiopia had adequate knowledge of neonatal danger signs. Additionally, barriers such as provider misconceptions and cultural beliefs contribute to vaccine hesitancy, as observed in studies from India and Nigeria (Albaugh et al., 2021; Umar & Ahmed, 2021).

Accessibility is another significant concern; inadequate healthcare infrastructure and transportation challenges hinder vaccinations, particularly for children living more than five kilometers from health facilities (Ogunbiyi et al., 2023). While vaccines are free, indirect costs can impose heavy burdens on low-income households (Gbadebo & Betsch, 2024). Systemic health weaknesses, such as shortages of trained personnel and inconsistent vaccine supplies, further complicate immunisation efforts. Comprehensive assessments of immunisation status—as opposed to mere coverage—are essential to tailor community-specific interventions effectively (Bobo et al., 2022). In Egbedore LGA, Osun State, immunisation coverage remains below the WHO target of 80%, necessitating targeted strategies to enhance uptake. This study aims to assess the immunisation status of children under five in Egbedore LGA between 2019 and 2024, focusing on identifying factors influencing vaccination uptake. The findings will contribute to public health initiatives aligned with Sustainable Development Goal 3, ultimately fostering equitable access to immunisation services and reducing child mortality.

Despite the availability of routine childhood immunisation services in Nigeria, significant disparities in vaccine uptake persist, particularly in rural areas like Egbedore Local Government Area (LGA) of Osun State. Immunisation coverage ranges from 58% to 74% in some parts of Osun, well below the WHO target of 80%, indicating challenges in service delivery, community awareness, and sociocultural barriers. Children under five are especially susceptible to vaccine-preventable diseases, with many remaining partially or fully unvaccinated. Existing data primarily reflect population-level coverage, obscuring individual-level barriers and deficiencies that hinder immunisation efforts.

The lack of disaggregated, up-to-date data on immunisation status in Egbedore LGA inhibits the development of effective, evidence-based interventions. Additionally, an inadequate understanding of the determinants of immunisation—such as sociodemographic characteristics, maternal knowledge, and healthcare accessibility—undermines efforts to address these gaps. A targeted assessment of immunisation status and its determinants is essential for informing strategies to improve outcomes and advance public health in the region.

LITERATURE REVIEW

Immunisation has made significant global progress, contributing to the reduction of vaccine-preventable diseases and child mortality rates. However, significant disparities persist, particularly in Sub-Saharan Africa and Nigeria, where lower immunisation rates are due to various challenges, including inadequate healthcare infrastructure, vaccine supply chain disruptions, financial barriers, vaccine hesitancy, and low public awareness (WHO, 2023). In Nigeria, Osun State reflects these challenges, with immunisation uptake varying significantly due to differences in healthcare access, parental education levels, and community engagement in vaccination programs (Akseer et al., 2020). Studies indicate that individual and community-level factors, such as maternal education and household wealth, significantly influence immunisation coverage. Children from lower-income households or rural areas, whose mothers have less education, are more likely to be unimmunised or partially immunised (Zemariam et al., 2024; Oleribe et al., 2017). Maternal education plays a critical role in improving immunisation rates, with educated mothers more likely to ensure their children receive timely vaccinations (Iwu et al., 2023). Additionally, the availability of healthcare facilities and transportation is a key determinant, particularly in rural areas where these services are often scarce or inaccessible (Tsegaw et al., 2024).

Geographical disparities also contribute to the uneven immunisation coverage, with rural areas often exhibiting lower immunisation rates due to logistical, socioeconomic, and cultural barriers (Melaku et al., 2020; Sato, 2022). In conflict-affected regions, vaccine access is even more limited, exacerbating these gaps (Zegeye et al., 2024). Furthermore, maternal healthcare utilisation, influenced by factors such as household wealth, education, and proximity to healthcare facilities, plays a vital role in ensuring vaccination coverage (Ochako et al., 2014; Adedokun et al., 2017). Addressing these socio-demographic and infrastructural barriers is essential to improving immunisation rates, particularly in underserved areas. Targeted interventions addressing these disparities can help bridge the gap and ensure that all children are adequately immunised, thus improving child health outcomes in rural and underserved regions.

METHODOLOGY

Research Design
Cross-sectional descriptive survey design using WHO vaccination coverage cluster survey methods

Study Setting
Egbedore LGA, Osun State, Nigeria — a rural district with ~16,500 children under five

Target Population

Children aged 0–59 months residing in Egbedore LGA with their caregivers.

Inclusion Criteria
Children under five years
Resident in Egbedore LGA ≥ six months
Consent given by caregiver

Exclusion Criteria
Children older than five. Records unavailable or caregiver declines participation.

Sample Size Determination
Using WHO EPI formula:

$$n = Z2 \cdot P(1-P) \cdot DEFFd2 = 820n = \frac{Z^2 \cdot P(1-P) \cdot DEFF}{d^2} = 820n = d2Z2 \cdot P(1-P) \cdot DEFF = 820$$

Where:
    Z = 1.96,
    P = 0.60,
    d = 0.05,
    DEFF = 2.0.
    Adjusted for 10% non-response. Final sample size = **400 participants**.

Sampling Technique
Two-stage cluster sampling:
Clusters selected using probability proportional to size.
Households within clusters selected via systematic random sampling

Instrument of Data Collection
Structured WHO-adapted questionnaire.
Data sources: vaccination cards (primary), health records (secondary), caregiver recall (tertiary).
Pilot tested for validity and reliability.

Ethical Permission/Issues
-Ethical approval obtained from Osun State Ministry of Health and Adeleke University REC.
- Informed consent was received from caregivers.
- Data confidentiality is maintained through encryption, anonymization, and secure storage.

RESULTS AND DISCUSSION

**Table 1: Sociodemographic Characteristics of Mothers/Caregivers and Households (N = 327)**

Variable	Category	Frequency (n)	Percentage (%)
Child's Age (in months)	0–11	74	22.6

Variable	Category	Frequency (n)	Percentage (%)
	12–23	102	31.2
	24–35	83	25.4
	36–47	44	13.5
	48–59	24	7.3
Child's Gender	Male	153	46.8
	Female	174	53.2
Mother's/Caregiver's Age (years)	<25	68	20.8
	25–34	157	48.0
	≥35	102	31.2
Mother's/Caregiver's Education Level	No formal education	41	12.5
	Primary school	79	24.2
	Secondary school	114	34.9
	Tertiary education	93	28.4
Mother's/Caregiver's Occupation	Farmer	88	26.9
	Trader	106	32.4
	Civil servant	78	23.9
	Unemployed	39	11.9
	Other	16	4.9
Father's Education Level	No formal education	37	11.3
	Primary school	76	23.2
	Secondary school	121	37.0
	Tertiary education	93	28.4
Father's Occupation	Farmer	94	28.7
	Trader	102	31.2
	Civil servant	76	23.2
	Unemployed	30	9.2
	Other	25	7.6
Household Monthly Income (₦)	Less than ₦10,000	58	17.7
	₦10,000–₦50,000	126	38.5
	₦50,000–₦100,000	97	29.7
	Above ₦100,000	46	14.1
Number of Children Under Five in	1	104	31.8

Variable	Category	Frequency (n)	Percentage (%)
Household			
	2	136	41.6
	≥3	87	26.6

The age distribution of children under five years revealed that the highest proportion (31.2%) were between 12 and 23 months, followed by 24–35 months (25.4%) and 0–11 months (22.6%). Children aged 36–47 months accounted for 13.5%, while only 7.3% were aged 48–59 months. This distribution suggests that a large proportion of children in the sample were in the early stages of the immunisation schedule, underscoring the relevance of immunisation-related assessments in this age group. In terms of gender, 174 children (53.2%) were female, while 153 (46.8%) were male. The gender distribution was relatively balanced, with a slight female predominance.


Figure 1: child's Age in Months and Gender
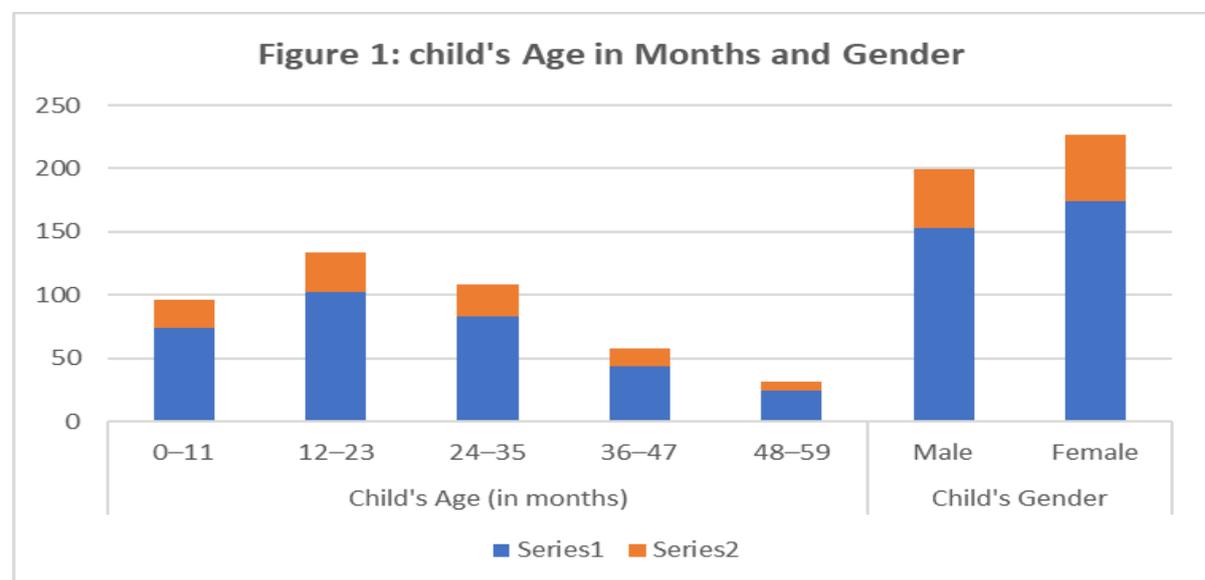
Maternal/Caregiver Characteristics

Regarding the age of mothers or caregivers, nearly half (48.0%) were aged 25–34 years, while 31.2% were aged 35 years and above. Younger mothers under the age of 25 constituted 20.8% of the sample. This age profile reflects a predominantly young to middle-aged caregiving population, which may influence knowledge and health-seeking behaviours related to child immunisation.

FIGURE 2: Mothers age, Level of Education and Occupation
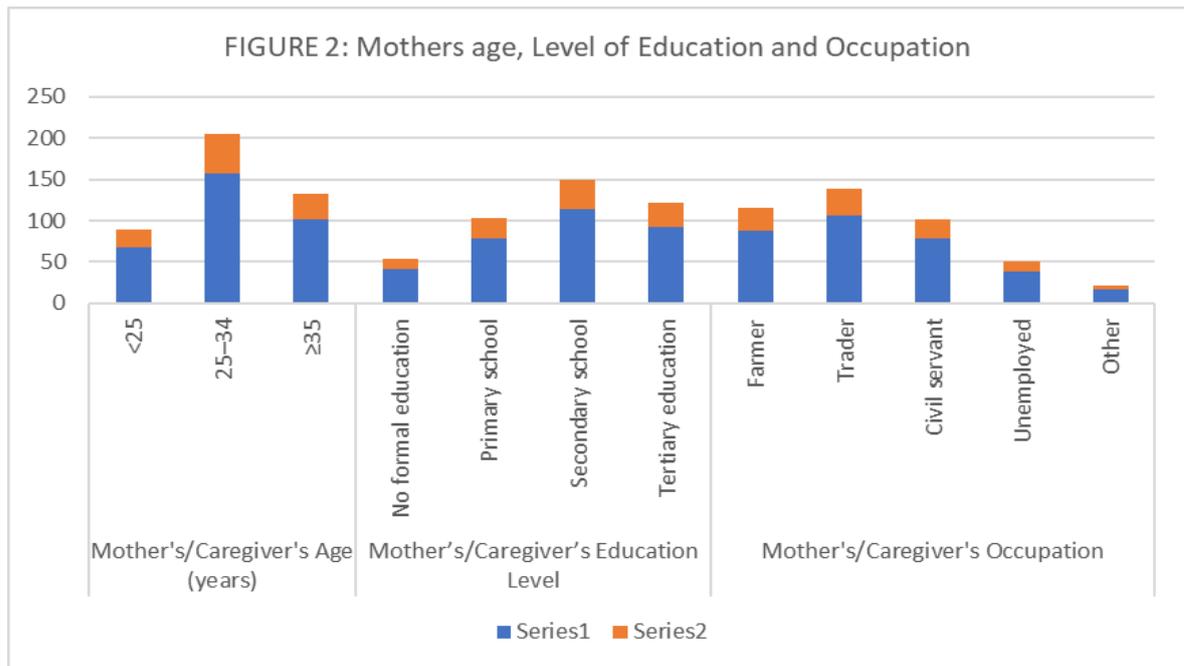
Educational attainment among mothers/caregivers showed that the majority had at least a secondary education. Specifically, 34.9% had completed secondary school, and 28.4% had tertiary education. However, 12.5% had no formal education, and 24.2% had only completed primary school. These figures indicate moderate levels of education, which is a potentially important determinant of immunisation awareness and uptake.

With regard to occupation, trading was the most common livelihood (32.4%), followed by farming (26.9%) and civil service (23.9%). A smaller proportion of respondents were unemployed (11.9%) or engaged in other occupations (4.9%). This occupational distribution reflects a predominantly informal and subsistence-based economic setting, characteristic of rural areas in Nigeria.

Figure 3: Father's Edu Level and Occupation
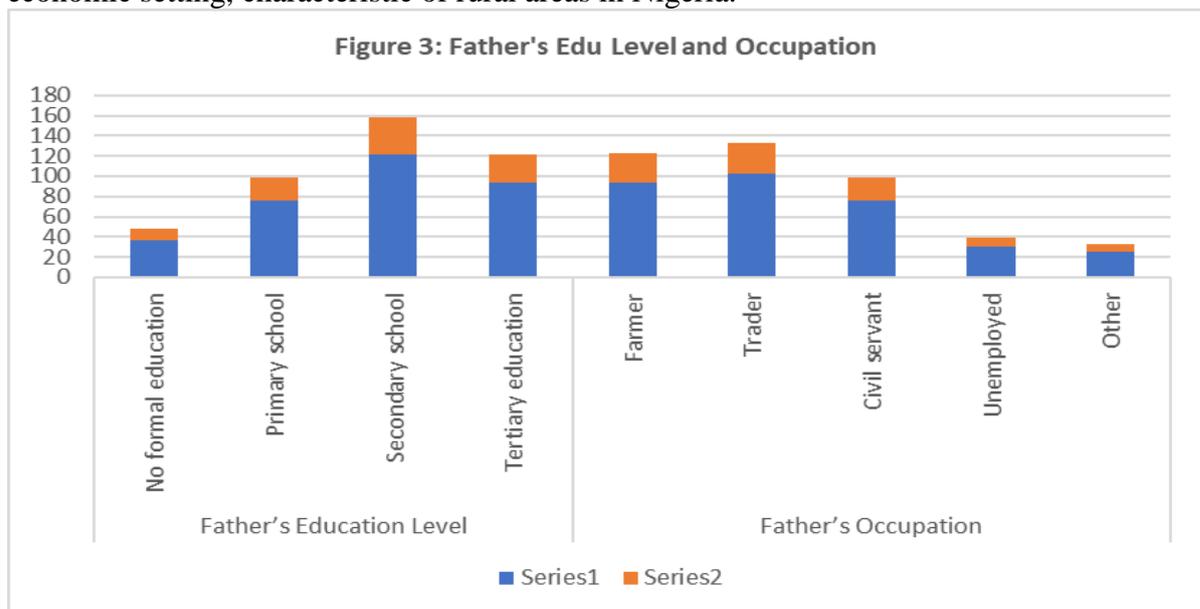
The educational level of fathers mirrored that of mothers. 37.0% had completed secondary education, and 28.4% had tertiary education. In contrast, 23.2% had primary-level education, and 11.3% had no formal education. This trend suggests

that while a fair proportion of fathers possess formal education, a significant number still lack higher-level qualifications, potentially impacting household health decisions.

Occupational data showed that trading (31.2%) and farming (28.7%) were the dominant economic activities among fathers, followed by civil service (23.2%). A smaller percentage of fathers were either unemployed (9.2%) or engaged in other occupations (7.6%). These figures underscore the rural nature of the study setting and the reliance on informal and agricultural economies.

Figure 4: Household Income and Num. of children
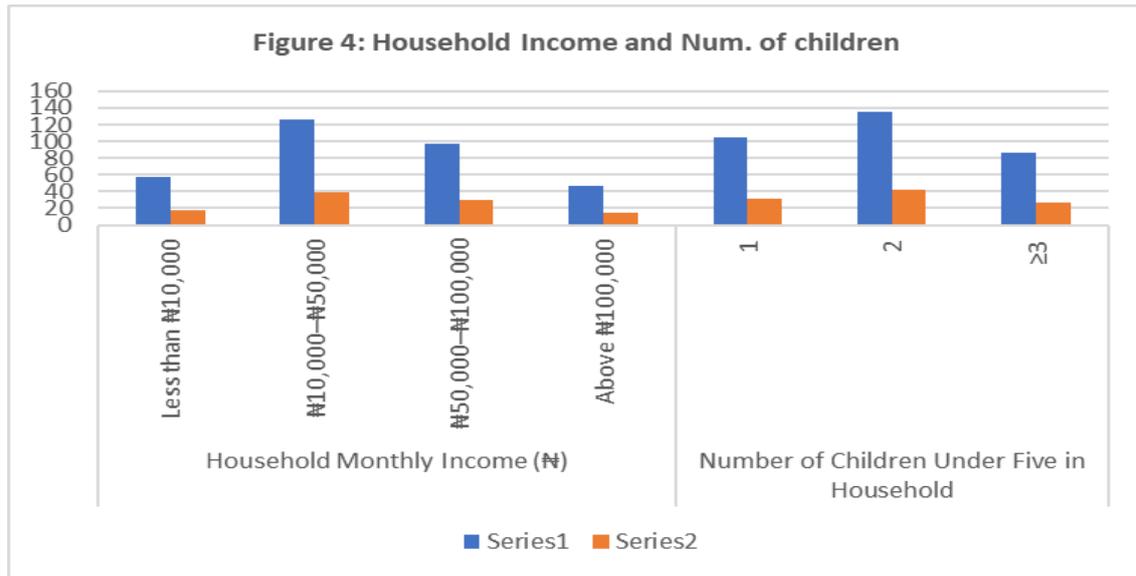
The analysis of household income revealed that the largest group (38.5%) earned between ₦10,000 and ₦50,000 monthly. This was followed by those earning between ₦50,000 and ₦100,000 (29.7%). Notably, 17.7% of households earned less than ₦10,000 monthly, highlighting economic hardship among a significant segment of the population. Only 14.1% reported earning above ₦100,000 monthly. These figures reflect socioeconomic constraints that may influence access to health services, including immunisation.

Finally, the majority of households had two children under five (41.6%), while 31.8% had one child, and 26.6% had three or more. Higher numbers of young children per household may affect immunisation decision-making and access, especially where resources are limited.

Table 2: Association between Sociodemographic Characteristics and Immunisation Status of Children (N = 327)

Variable	Category	Fully Immunised n (%)	Not/Partially Immunised n (%)	Chi-square (χ^2)	p-value
Child's Gender	Male	84 (54.9%)	69 (45.1%)	1.24	0.265
	Female	106 (60.9%)	68 (39.1%)		
Mother's	<25	32 (47.1%)	36 (52.9%)	6.47	0.039*

Variable	Category	Fully Immunised n (%)	Not/Partially Immunised n (%)	Chi-square (χ²)	p-value
Age					
	25–34	102 (65.0%)	55 (35.0%)		
	≥35	56 (54.9%)	46 (45.1%)		
Mother's Education	No formal education	13 (31.7%)	28 (68.3%)	22.91	0.000**
	Primary	41 (51.9%)	38 (48.1%)		
	Secondary	75 (65.8%)	39 (34.2%)		
	Tertiary	61 (65.6%)	32 (34.4%)		
Mother's Occupation	Farmer	42 (47.7%)	46 (52.3%)	10.38	0.035*
	Trader	66 (62.3%)	40 (37.7%)		
	Civil Servant	58 (74.4%)	20 (25.6%)		
	Unemployed	12 (30.8%)	27 (69.2%)		
	Other	12 (75.0%)	4 (25.0%)		
Father's Education	No formal education	15 (40.5%)	22 (59.5%)	13.67	0.003**
	Primary	40 (52.6%)	36 (47.4%)		
	Secondary	78 (64.5%)	43 (35.5%)		
	Tertiary	57 (61.3%)	36 (38.7%)		
Household Income (₦)	<₦10,000	20 (34.5%)	38 (65.5%)	17.22	0.001**
	₦10,000–₦50,000	76 (60.3%)	50 (39.7%)		
	₦50,000–₦100,000	62 (63.9%)	35 (36.1%)		
	>₦100,000	32 (69.6%)	14 (30.4%)		
Children U5 in Household	1	72 (69.2%)	32 (30.8%)	9.88	0.007**
	2	82 (60.3%)	54 (39.7%)		
	≥3	36 (41.4%)	51 (58.6%)		

*p < 0.05 is statistically significant

**p < 0.01 is highly significant

Table 2 presents the bivariate analysis between selected sociodemographic variables and the immunisation status (fully immunised vs. partially/not immunised) of children under five years of age. Chi-square (χ²) tests were used to assess the level of association, with statistical significance set at $p < 0.05$. The analysis shows that 60.9% of female children were fully immunised compared to 54.9% of males. Although female children had slightly higher immunisation rates, the difference was not statistically significant ($χ² = 1.24$, $p = 0.265$). There was a statistically significant

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association between the age of the mother/caregiver and the immunisation status of the child ($\chi^2 = 6.47$, $p = 0.039$). Children of mothers aged 25–34 had the highest full immunisation rate (65.0%), followed by those aged ≥35 (54.9%). Mothers under 25 had the lowest rate, with only 47.1% of their children being fully immunised. This trend suggests that middle-aged mothers may have better awareness, resources, or motivation to complete immunisation schedules. Maternal education was strongly associated with child immunisation status ($\chi^2 = 22.91$, $p < 0.001^*$). Children of mothers with tertiary or secondary education had significantly higher full immunisation rates (65.6% and 65.8%, respectively) compared to those whose mothers had no formal education (31.7%).

A significant relationship was also observed between maternal occupation and immunisation status ($\chi^2 = 10.38$, $p = 0.035$). Children of civil servants had the highest full immunisation rate (74.4%), while those of unemployed mothers had the lowest (30.8%). Farmers and traders had intermediate rates (47.7% and 62.3%, respectively). Father's education showed a significant association with immunisation status ($\chi^2 = 13.67$, $p = 0.003^*$). Full immunisation was most common among children whose fathers had secondary (64.5%) or tertiary education (61.3%). Children of fathers with no formal education had the lowest rates (40.5%). This reinforces the broader impact of parental education—particularly paternal involvement—on child health outcomes. Household income was a strong determinant of immunisation status ($\chi^2 = 17.22$, $p = 0.001^*$). Children from households earning above ₦100,000 had the highest immunisation rates (69.6%), followed by those in the ₦50,000–₦100,000 bracket (63.9%). Conversely, only 34.5% of children from households earning less than ₦10,000 were fully immunised. A significant inverse relationship was observed between the number of under-five children in a household and immunisation status ($\chi^2 = 9.88$, $p = 0.007^*$). Households with only one child had the highest rate of full immunisation (69.2%), whereas those with three or more under-five children had the lowest (41.4%).

Discussion of Findings

This study investigated the immunisation status of children under five years in Egbedore Local Government Area (LGA), Osun State, Nigeria, with a particular focus on the sociodemographic factors influencing vaccine uptake. The findings not only illuminate prevailing patterns of immunisation in a rural Nigerian context but also underscore the enduring influence of social determinants on child health outcomes. The age distribution of children under five revealed that the majority fell within the 12–35 month age range, which represents a critical window in the national immunisation schedule. This suggests a timely opportunity for public health interventions aimed at completing vaccination schedules. The gender distribution was balanced, and importantly, there was no statistically significant difference in immunisation status between male and female children ($p = 0.265$). This implies a commendable degree of gender neutrality in parental decision-making, at least in terms of vaccine uptake—an encouraging sign in a region where gender disparities in healthcare access have historically been noted.

Maternal age was significantly associated with immunisation status ($\chi^2 = 6.47$, $p = 0.039$). Children of mothers aged 25–34 years had the highest full immunisation rates (65.0%), indicating that this age group may possess an optimal balance of health awareness, autonomy, and economic stability to make informed health decisions. In contrast, younger mothers (<25 years) exhibited lower immunisation rates (47.1%),

possibly reflecting limited experience or constrained access to information and resources.

Perhaps the most powerful determinant of immunisation status observed was maternal education ($\chi^2 = 22.91$, $p < 0.001*$). Children of mothers with secondary or tertiary education were significantly more likely to be fully immunised (65.8% and 65.6%, respectively), compared to only 31.7% among those whose mothers had no formal education. This finding is consistent with global literature, which positions maternal education as a linchpin in improving child health outcomes (Yibelta et al., 2022; Bobo et al., 2022). Educated mothers are not only more likely to recognise the benefits of immunisation but are also better equipped to navigate healthcare systems, adhere to vaccination schedules, and resist misinformation.

Beyond education, maternal occupation was significantly associated with child immunisation outcomes ($\chi^2 = 10.38$, $p = 0.035$). Notably, children of civil servant mothers had the highest immunisation rates (74.4%), while those of unemployed mothers had the lowest (30.8%). This suggests that employment in the formal sector may provide better access to health information, workplace health benefits, or flexible schedules conducive to healthcare utilisation.

Paternal education, often overlooked in immunisation discourse, also showed a significant association with child immunisation ($\chi^2 = 13.67$, $p = 0.003*$). Children whose fathers had at least secondary education were more likely to be fully immunised. This reinforces growing evidence that men's education and involvement are critical to improving maternal and child health, particularly in patriarchal societies where fathers often hold decision-making authority over household expenditures and healthcare access.

Household income emerged as another powerful predictor of immunisation ($\chi^2 = 17.22$, $p = 0.001*$). Full immunisation was highest among children from higher-income households (>₦100,000), whereas children from the lowest income bracket (<₦10,000) had the lowest rates (34.5%). This finding supports the premise that while vaccines are provided free of charge under Nigeria's Expanded Programme on Immunisation (EPI), indirect costs—such as transportation, time off work, and hidden fees—pose substantial barriers for economically disadvantaged families (Osman et al., 2024; Gbadebo & Betsch, 2024).

Another notable finding was the inverse relationship between the number of under-five children in a household and immunisation status ($\chi^2 = 9.88$, $p = 0.007*$). Households with a single child had the highest immunisation completion (69.2%), while those with three or more young children had the lowest (41.4%). This may reflect stretched resources—financial, emotional, and logistical—that limit a caregiver's ability to consistently access health services. Similar findings have been reported in studies across Sub-Saharan Africa, where large household size has been associated with reduced health service utilisation (Ogundeji & Adepoju, 2022).

Collectively, the findings of this study reinforce a central theme in public health: that access to and utilisation of preventive health services are deeply embedded within social and economic structures. Even in contexts where vaccines are available and theoretically accessible, uptake remains uneven due to the intersecting influences of parental education, income, occupation, and household dynamics.

These results are congruent with the World Health Organization's (WHO) conceptual framework on the social determinants of health, which posits that health inequalities arise from the conditions in which people are born, grow, live, work, and age (WHO, 2024). In Egbedore LGA, as in many rural Nigerian communities, the

interplay of structural poverty, low health literacy, and overburdened caregivers undermines the reach of otherwise well-intentioned immunisation programmes.

CONCLUSION

This study highlights the persistent socio-demographic disparities that shape childhood immunisation coverage in rural Nigeria. While gender equity in vaccine access appears strong, gaps remain in relation to maternal age, education, economic capacity, and household structure.

RECOMMENDATION

To address these gaps, it is imperative that immunisation interventions in rural areas go beyond the supply of vaccines. Instead, they must be integrated into broader community-based strategies that:

1. Prioritise maternal education and empowerment
2. Engage fathers in health promotion activities
3. Provide logistical support such as mobile vaccination teams and transport vouchers
4. Tailor health messaging using culturally relevant communication channels
5. Moreover, collaboration with local leaders and religious institutions may help bridge trust gaps and counteract misinformation.
6. Economic interventions, such as conditional cash transfers, have also proven effective in incentivising health-seeking behaviour and could be adapted to support immunisation adherence in low-income households.

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