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Maternal Characteristics and Reported Full Immunization Status of Children Under Five Years in Nursery Schools in Owerri Municipality, Imo State, Nigeria

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Abstract

Childhood immunization remains one of the most effective public health interventions for preventing morbidity and mortality from vaccine-preventable diseases. However, completion of recommended childhood vaccination schedules may vary according to maternal and household characteristics. This study examined the reported pattern of full immunization among children under five years in relation to maternal age and educational attainment in nursery schools in Owerri Municipality, Imo State, Nigeria. A cross-sectional survey design was adopted. The study population comprised 9,713 mothers whose children were enrolled in nursery schools in Owerri Municipality. A sample of 398 mothers was selected using a clustered sampling approach. Data were collected using a researcher-developed Maternal Factors on the Immunization Status of Under-5 Nursery Children Questionnaire (MFISUNCQ), which had a reported reliability coefficient of 0.84. Data were analysed using mean and standard deviation, with a criterion mean of 2.50. Mothers aged 21–25, 26–30, 31–35 and 36–40 years recorded mean scores of 2.79, 2.85, 2.85 and 2.85, respectively, whereas mothers aged 41–45 years recorded a mean of 1.73. The overall mean was 2.61. Regarding educational attainment, mothers with first-degree, postgraduate diploma, master's and doctoral qualifications recorded mean scores of 3.33, 2.98, 3.03 and 2.67, respectively, while those with O-level education recorded a mean of 1.66. The overall mean was 2.73. The findings indicate generally favourable reported patterns of full immunization among mothers aged 21–40 years and among mothers with higher educational attainment. Immunization programmes should strengthen targeted health education and follow-up for mothers who may experience informational or access-related barriers to completing childhood vaccination schedules.

Keywords: maternal age; maternal education; childhood immunization; vaccination; under-five children; nursery schools; Nigeria

Introduction

Childhood immunization is a cornerstone of preventive healthcare and one of the most effective public health interventions for reducing morbidity and mortality from vaccine-preventable diseases. Vaccination protects children against a range of potentially serious infections and contributes to reductions in childhood deaths and disability. At the population level, high vaccination coverage also reduces the circulation of vaccine-preventable infections and strengthens community protection. The World Health Organization (WHO)

identifies immunization as a major component of primary healthcare and a critical investment in population health (World Health Organization [WHO], 2020, 2025).

Despite substantial global progress, gaps in routine childhood vaccination remain an important public health concern. WHO reported that 14.3 million children worldwide were zero-dose children in 2024, while global coverage with the third dose of diphtheria-tetanus-pertussis-containing vaccine was approximately 85% (WHO, 2025). These global figures conceal substantial differences across countries and population groups. The Immunization Agenda 2030 emphasises equity, country ownership, data-driven programming and context-specific strategies to ensure that all children benefit from vaccines (WHO, 2020).

Immunization status refers to the extent to which a child has received vaccines recommended for their age according to the applicable national immunization schedule. A child may be regarded as fully immunized when the recommended age-appropriate vaccines and doses have been received, while children who have received some but not all recommended vaccines may be classified as partially immunized. Children who have received none of the recommended routine vaccines are considered unimmunized. Accurate documentation is important for determining vaccination status, identifying missed doses and supporting appropriate follow-up. Evidence from Nigeria has shown that the presence of a child health card is significantly associated with childhood immunization coverage (Oleribe et al., 2017).

Incomplete childhood immunization remains particularly important in Nigeria. Evidence from nationally representative Nigerian data indicates substantial disparities in vaccination coverage according to maternal, household and socioeconomic characteristics. Adedokun et al. (2017) found that incomplete childhood immunization was influenced by individual, community and state-level factors. Their analysis showed that children of mothers with lower educational attainment were more likely to be incompletely immunized and that maternal age, antenatal care, place of delivery, residence and socioeconomic disadvantage were also relevant. Similarly, Oleribe et al. (2017) found significant relationships between childhood immunization coverage and maternal age, education, literacy, wealth, marital status, occupation and other socioeconomic characteristics.

The determinants of childhood immunization are therefore multidimensional. They include maternal and child characteristics, household socioeconomic circumstances, accessibility of healthcare facilities, availability of vaccines, health-system characteristics, community influences and caregivers' knowledge and perceptions (Adedokun et al., 2017; Oleribe et al., 2017). Interventions designed to improve immunization coverage consequently need to address more than vaccine availability alone. Evidence from a Cochrane review indicates that health education, communication, home visits and other multifaceted approaches may improve childhood immunization coverage, although the effectiveness of individual strategies varies according to context (Oyo-Ita et al., 2016, 2023).

Maternal characteristics are particularly relevant because mothers frequently play a central role in decisions concerning children's preventive healthcare. Maternal education may influence the ability to obtain, understand and apply health information, recognise the

importance of preventive services and communicate with health workers. Nigerian evidence indicates that maternal education is associated with childhood immunization coverage (Adedokun et al., 2017; Oleribe et al., 2017). Evidence from Ethiopia similarly found that children of more educated mothers were more likely to be fully vaccinated (Kelkay & Seid, 2018).

Maternal age may also be relevant to childhood immunization. Age may reflect differences in maternal experience, exposure to health information, health-seeking behaviour and familiarity with child healthcare services. Ratta and Meshram (2020), in a cross-sectional study of under-five children and their mothers, found significant relationships between immunization status and maternal age and education, among other factors. However, the direction and magnitude of the relationship between maternal age and immunization may vary across settings because maternal age interacts with education, socioeconomic circumstances, access to services and health-seeking behaviour.

Evidence from Nigeria further demonstrates the importance of maternal health-seeking behaviour and socioeconomic circumstances. Bisiriyu and Ojewumi (2014), using Nigerian data, reported that maternal education, place of antenatal care, place of delivery, occupation, residence and household wealth were associated with childhood vaccination status. Their findings reinforce the importance of considering maternal characteristics within the wider social and healthcare environment rather than treating immunization uptake as a consequence of a single demographic characteristic.

Household vulnerability is another important contextual factor. Ojewumi et al. (2023) found that childhood immunization in Nigeria varied significantly according to household vulnerability, with the likelihood of complete immunization decreasing as household vulnerability increased. Their findings indicate that geographic, social, economic and demographic circumstances may interact with maternal health practices to influence children's immunization status.

More recent evidence from southwestern Nigeria demonstrates that immunization gaps remain relevant. Salako et al. (2024), in a cross-sectional study of children aged 12–59 months in Lagelu Local Government Area of Ibadan, found that only 65.3% of children whose vaccination cards were appropriately completed had received all basic vaccines. The study also found a significant difference in basic vaccination completion according to maternal educational level and reported access-related barriers among caregivers who missed due vaccines. These findings are particularly relevant to the present study because both settings are located in southwestern Nigeria.

Maternal knowledge and perceptions may also influence vaccination practices. Solagbade and Titiloye (2023), in their study of mothers of under-five children in Ibadan North-West Local Government Area, examined knowledge, attitudes and perceptions towards vaccination during supplementary immunization activities. Their work highlights the importance of maternal understanding and perceptions in vaccination programmes and supports the use of health education and communication as components of immunization strategies.

Evidence from other settings also supports the relevance of maternal characteristics. Kelkay and Seid (2018) reported that maternal education was among the factors associated with vaccination status among under-five children in South Omo Zone, Ethiopia. Similarly, Ratta and Meshram (2020) found that maternal age and education were associated with immunization status in an Indian rural health setting. Although these studies were conducted outside southeastern Nigeria, they provide useful comparative evidence regarding the potential importance of maternal characteristics.

The relationship between maternal characteristics and immunization can also be understood through the Health Belief Model (HBM). Rosenstock (1966) proposed that health behaviour is influenced by individuals' perceptions of susceptibility, severity, benefits, barriers and cues to action. Rosenstock (1974) subsequently described the historical development of the HBM and its application to preventive health behaviour. Applied to childhood immunization, a mother who perceives vaccine-preventable diseases as serious and vaccination as beneficial may be more likely to ensure that her child receives recommended vaccines. Conversely, perceived barriers, inadequate information, concerns about adverse effects or weak cues to action may reduce timely vaccination.

Maternal education may influence the ability to access and interpret health information, whereas maternal age may be related to experience, health-seeking behaviour and exposure to health messages. The HBM therefore provides a useful conceptual framework for considering how maternal characteristics may operate alongside perceptions and contextual barriers in shaping childhood immunization practices.

The local context is important because immunization coverage and its determinants vary across geographical and socioeconomic settings. Evidence from southwestern Nigeria demonstrates that maternal characteristics, health-service utilisation and household circumstances influence vaccination, but there is comparatively limited evidence specifically focused on mothers of nursery-school children in Owerri Municipality. Generating context-specific evidence is important because health educators, primary healthcare providers and immunization programme managers require local information when designing education, communication and follow-up strategies.

The public health concern underlying the present study is therefore the possibility that maternal age and educational attainment may be reflected in differences in reported completion of childhood immunization. Ideally, all children should receive age-appropriate vaccines irrespective of their mothers' demographic characteristics. However, if certain groups of mothers demonstrate less favourable vaccination-related response patterns, targeted education and support may be warranted.

Despite the availability of free immunization services in Nigeria, many children under the age of five in Owerri Municipality remain partially or completely unimmunized. Studies and reports from health authorities have shown that maternal factors such as level of education, age, employment status and religious beliefs, significantly influence immunization uptake. In many cases, mothers may delay or skip vaccinations due to lack of information, fear of side

effects, poor accessto healthcare facilities, or misconceptions about vaccines. This situation contributes to the persistence of preventable diseases and avoidable child deaths in the region.

This study was consequently undertaken to examine the reported pattern of full immunization among children under five years in relation to maternal age and educational attainment among mothers whose children were enrolled in nursery schools in Owerri Municipality, Imo State, Nigeria. The study focused on maternal age and educational attainment because of their documented relevance to childhood vaccination and their potential importance for health information access, decision-making and utilisation of preventive child health services. However, the study would provide context-specific evidence on maternal characteristics associated with childhood immunization among nursery-school children in Owerri Municipality, which can support health educators, primary healthcare providers, immunization programme managers and policymakers in designing more targeted maternal health education, communication and follow-up strategies to improve completion of routine childhood vaccination and strengthen protection against vaccine-preventable diseases.

Methods

Study design and setting

A cross-sectional survey design was adopted for the study. The design involved collecting information from mothers at a single period to examine maternal characteristics and their reported relationship with the immunization status of their children.

The study was conducted in Owerri Municipality, Imo State, southeastern Nigeria. The study population was drawn from mothers of children enrolled in nursery schools within the municipality. The study covered the five villages of Owerri Municipality: Umuororonjo, Amawom, Umuonyeche, Umuodu and Umuoyima.

Study population

The target population comprised 9,713 mothers who had children enrolled in nursery schools in Owerri Municipality. The population was distributed across the five villages within the study area.

Sample size and sampling technique

A sample of 398 mothers was selected from the population of 9,713. The sample comprised 80 mothers from Umuororonjo, 80 from Amawom, 80 from Umuonyeche, 79 from Umuodu and 79 from Umuoyima.

A clustered sampling approach was used. The five villages served as clusters, after which eligible mothers were recruited through nursery schools located within the respective communities. Permission was sought from the proprietors or administrators of participating nursery schools before data collection. Mothers were invited to participate on specified dates.

Data verification note: The frequencies in the supplied maternal-age table sum to 384 rather than 398. The original dataset should therefore be checked and the frequencies corrected before submission.

Data collection instrument

Data were collected using a researcher-developed instrument titled Maternal Factors on the Immunization Status of Under-5 Nursery Children Questionnaire (MFISUNCQ).

The MFISUNCQ contained items assessing maternal factors in relation to the reported immunization status of children under five years. Responses were obtained on a four-point Likert-type scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Positively worded items were scored 4, 3, 2 and 1, respectively, whereas negatively worded items were reverse-scored as 1, 2, 3 and 4.

The sociodemographic section collected information on maternal characteristics, including age and educational attainment.

The instrument was subjected to face and content validation by three experts in life science department, Imo State University Owerri before administration. The validation process assessed the relevance, clarity and adequacy of the items for measuring maternal factors related to childhood immunization. Corrections and suggestions arising from the validation process were incorporated into the final version of the instrument.

The reliability of the instrument was assessed using the Pearson product-moment correlation coefficient and yielded a coefficient of 0.84. This value indicates satisfactory reliability for the instrument.

Data collection procedure

Before data collection commenced, permission was sought from the relevant nursery-school authorities. Eligible mothers were approached and provided with information about the purpose and procedures of the study. Participation was voluntary.

Participants were informed about the purpose of the study, what participation involved, their right to decline participation or withdraw without penalty, and the measures adopted to protect their privacy and confidentiality. Written informed consent was obtained before questionnaire administration.

Questionnaires were administered to eligible mothers at agreed locations and times within the participating nursery schools. Participants were given adequate time to complete the questionnaire, after which completed instruments were retrieved and checked for completeness.

Privacy was maintained during data collection. Participants' names were not required on the questionnaire, and completed instruments were identified using codes rather than personal

identifiers. The information obtained was treated confidentially and used exclusively for research purposes.

Data analysis

Data were analysed using descriptive statistics. Mean and standard deviation were used to answer the research questions. A criterion mean of 2.50 was adopted as the decision point for the four-point response scale. Mean scores of 2.50 or above were interpreted as favourable/positive responses, whereas mean scores below 2.50 were interpreted as unfavourable/negative responses.

Results

Table 1: **Maternal Age and Reported Full Immunization of Children Under Five Years**

Maternal Age	Mean	SD	Decision
21-25 years	2.79	1.17	Favourable
26-30 years	2.85	1.16	Favourable
31-35 years	2.85	1.17	Favourable
36-40 years	2.85	1.17	Favourable
41-45 years	1.73	1.17	Unfavourable
Overall mean	2.61		Favourable

Table 1 shows that mothers aged 21–25, 26–30, 31–35 and 36–40 years recorded mean scores above the criterion mean of 2.50, with mean scores of 2.79, 2.85, 2.85 and 2.85, respectively. Mothers aged 41–45 years recorded a mean score of 1.73, which was below the criterion mean. The overall mean of 2.61 was above the criterion mean and indicates a generally favourable reported pattern concerning maternal age and full immunization of children under five years.

Table 2: **Maternal Educational Attainment and Reported Full Immunization of Children Under Five Year**

Maternal Educational Attainment	Mean	SD	Decision
O level	1.66	0.93	Unfavourable
First degree	3.33	0.78	Favourable
Postgraduate diploma	2.98	0.81	Favourable
Master’s degree	3.03	0.77	Favourable
PhD degree	2.67	0.86	Favourable
Overall mean	2.73		Favourable

Table 2 shows that mothers with first-degree, postgraduate diploma, master's and doctoral qualifications recorded mean scores above the criterion mean of 2.50. Their respective mean scores were 3.33, 2.98, 3.03 and 2.67. Mothers with O-level education recorded a mean score of 1.66, which was below the criterion mean. The overall mean of 2.73 was above the criterion mean, indicating a generally favourable reported pattern concerning maternal educational attainment and full immunization of children under five years.

Discussion

The study found a generally favourable reported pattern between maternal age and full immunization among children under five years. Mothers aged 21–40 years recorded mean scores above the criterion mean, whereas mothers aged 41–45 years recorded a mean below the criterion value. The overall mean of 2.61 indicated a generally favourable response pattern concerning maternal age and reported full immunization.

This finding is broadly consistent with Ratta and Meshram (2020), who identified maternal age as one of the factors significantly associated with immunization status among under-five children. In their study, age was among several maternal and child characteristics associated with vaccination status. Similarly, evidence from Nigeria indicates that maternal age is associated with childhood immunization coverage. Oleribe et al. (2017), using Nigerian demographic and health data, reported that maternal age and other parental characteristics were significantly associated with immunization coverage. Adedokun et al. (2017) also found that maternal age was relevant to incomplete childhood immunization in Nigeria.

The favourable pattern observed among mothers aged 21–40 years may reflect differences in maternal experience, exposure to health information and interaction with health services. Older mothers may have greater experience with child healthcare and vaccination services. However, the present study cannot establish that maternal age causes better or poorer immunization because the analysis was descriptive and cross-sectional. Other factors, including maternal education, household socioeconomic circumstances, access to healthcare and health-service utilisation, may contribute to the observed pattern.

The finding regarding maternal educational attainment showed an even clearer descriptive pattern. Mothers with first-degree, postgraduate diploma, master's and doctoral qualifications recorded mean scores above the criterion mean, while mothers with O-level education recorded a mean below the criterion value. The overall mean of 2.73 indicated a generally favourable reported pattern between maternal educational attainment and full immunization.

This finding agrees with Kelkay and Seid (2018), who found maternal education to be an important determinant of vaccination status among under-five children in Ethiopia. The finding is also consistent with Ratta and Meshram (2020), who reported a significant association between maternal education and immunization status. Evidence from Nigeria provides similar support. Adedokun et al. (2017) reported that the likelihood of incomplete childhood immunization decreased as maternal education increased, while Oleribe et al. (2017) found educational attainment to be significantly associated with childhood immunization coverage.

The observed pattern may partly be explained by the role of education in facilitating access to and understanding of health information. Mothers with higher educational attainment may be better positioned to understand vaccination schedules, recognise the preventive value of immunization and communicate with healthcare providers. Education may also improve mothers' ability to identify appropriate sources of health information and navigate health services.

The findings are also consistent with evidence from southwestern Nigeria. Bisiriyu and Ojewumi (2014) reported that maternal education and other socioeconomic and health-seeking characteristics significantly influenced childhood vaccination status. Similarly, Salako et al. (2024) found a significant difference in completion of basic vaccination according to maternal educational level among children aged 12–59 months in Lagelu Local Government Area, Ibadan. Their study is particularly relevant because it was conducted in southwestern Nigeria and involved children within the same broad age range as the present study.

Ojewumi et al. (2023) further demonstrated that childhood immunization in Nigeria is influenced by household vulnerability. Their findings showed a progressive reduction in full immunization as household vulnerability increased. This suggests that maternal educational attainment should not be interpreted in isolation because education interacts with economic circumstances, geographic access, social conditions and maternal health practices.

The findings also have implications for health education. Solagbade and Titiloye (2023) highlighted the importance of maternal knowledge, attitudes and perceptions towards vaccination among mothers of under-five children in Ibadan. This supports the need for immunization communication that is understandable, accessible and responsive to mothers' information needs. Health education may be particularly important for mothers with lower educational attainment because health messages may need to be presented using clear language and practical explanations rather than relying on written information alone.

The Health Belief Model provides a useful interpretation of these findings. Rosenstock (1966, 1974) proposed that preventive health behaviour is influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers and cues to action. In the context of childhood immunization, mothers who understand the seriousness of vaccine-preventable diseases and perceive vaccination as beneficial may be more likely to complete recommended vaccination schedules. Conversely, concerns about adverse effects, inadequate information, inconvenience or difficulties accessing services may serve as barriers.

The findings therefore suggest that maternal characteristics may be useful indicators for targeting immunization education, but they should not be viewed as deterministic. The evidence from Nigeria indicates that childhood vaccination is influenced by a combination of maternal, household, community and health-system factors (Adedokun et al., 2017; Ojewumi et al., 2023; Oleribe et al., 2017). Consequently, interventions should combine maternal health education with accessible services, reminder systems, community engagement and appropriate follow-up.

The results should also be interpreted in light of the study's measurement approach. The study used means and standard deviations to describe mothers' responses. Therefore, the observed differences between maternal-age and educational groups represent descriptive response patterns and should not be interpreted as statistically significant associations. Inferential studies involving larger samples and appropriate regression models would be required to determine whether maternal age and educational attainment independently predict complete childhood immunization after adjustment for potential confounding variables.

Strengths and Limitations

A major strength of the study is its focus on maternal characteristics and childhood immunization within a defined population of mothers of nursery-school children in Owerri

Municipality. The study also provides local evidence that may be useful to health educators, primary healthcare providers and immunization programme managers in developing targeted educational and follow-up strategies.

The use of a structured researcher-developed instrument with a reported reliability coefficient of 0.84 also provides support for the consistency of the measurement approach.

However, several limitations should be acknowledged. First, the cross-sectional design prevents causal conclusions regarding maternal age, educational attainment and immunization status. Second, the study relied on maternal responses, which may be affected by recall and social-desirability bias. Third, the use of mean and standard deviation alone does not permit adjustment for potential confounding variables or estimation of independent associations. Fourth, reported immunization status was not objectively verified using children's immunization cards or health-facility records. Objective verification would improve the validity of future studies.

A further limitation concerns the supplied maternal-age data. The frequencies associated with the maternal-age categories reportedly sum to 384 rather than the stated sample size of 398. This discrepancy should be reconciled against the original dataset before final journal submission.

Conclusion

The study found generally favourable reported patterns of full immunization among children under five years in relation to maternal age and educational attainment in nursery schools in Owerri Municipality, Imo State, Nigeria. The reported pattern was favourable among mothers aged 21–40 years and among mothers with first-degree, postgraduate diploma, master's and doctoral qualifications, while mothers aged 41–45 years and those with O-level education recorded mean scores below the criterion mean.

The findings suggest that maternal characteristics may be useful considerations when designing childhood immunization education and follow-up interventions. However, because the study used a cross-sectional design and descriptive analysis, the findings should be interpreted as response patterns rather than statistically established associations or causal effects.

Recommendations

Based on the findings, the following recommendations are made:

1. Health authorities should strengthen targeted immunization education for mothers with lower educational attainment.

2. Immunization messages should be delivered in clear, accessible and culturally appropriate language through community-based channels capable of reaching mothers across different age and educational groups.

3. Primary healthcare providers should use antenatal, postnatal, child-welfare and routine immunization contacts to reinforce information concerning the importance of completing recommended childhood vaccination schedules.

4. Health facilities should strengthen reminder and follow-up systems for children who miss scheduled vaccine doses.

5. Mothers should be encouraged to retain children's immunization cards, while health facilities should maintain accurate vaccination records to facilitate identification and follow-up of missed or delayed doses.

6. Future studies should employ inferential statistical methods, particularly multivariable logistic regression, to determine whether maternal age and educational attainment independently predict complete immunization after adjustment for relevant maternal, household and health-service factors.

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