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Research Article

DETERMINANTS OF CHILDHOOD IMMUNIZATION COMPLETION IN NASARAWA NORTH SENATORIAL DISTRICT NASARAWA STATE, NIGERIA: A CROSS-SECTIONAL COMMUNITY BASED STUDY

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Abstract

Childhood immunization remains a fundamental public health strategy for reducing morbidity and mortality among under-five children in Nigeria, yet completion rates remain suboptimal, particularly in underserved regions such as Nasarawa State. This study aims to examine determinants influencing childhood immunization completion across communities in Nasarawa North Senatorial district with emphasis on contextual health system dynamics and service accessibility patterns. A cross-sectional descriptive design was employed, involving structured interviews with 403 caregivers, across selected communities in three local government areas of the Nasarawa North Senatorial Districts. Most notable in full immunization coverage of children in relation to age groups, between age25 -35 were the highest with 111 (82.6%) out of 134 respondents. Married caregivers had the highest fully immunized children with 261 (75.7%) out of 345 respondents. In relation to educational level, the highest respondents were non-formal education with 20 (87.05) out of 23. In relation to gender, children with female caregivers had the highest coverage with 266 (74.9%) out of 355 respondents. In respect to economics factors: High income earners had 30 (93.8%) out 32 respondents while in occupation factor, civil servant had the highest coverage of 74(89.2%) out 83 respondents. The complete immunization coverage of the children were significantly associated with level of education (P=0.00166), income (P=0.03068) and challenges associated with immunization (P=0.01499), occupation ($P=1.205\times10^{-5}$), religious belief ($P=5.879\times10^{-9}$) and cultural belief ($P=1.807\times10^{-16}$) of the caregivers but insignificantly associated with the age (P=0.07191), gender (P=0.59910) and marital status (P=0.30850) of the caregivers. However, Caregivers with active health education campaigns reported a higher completion rate of 74.7%. The study recommends increasing awareness creation in Nasarawa North Senatorial district can achieve higher immunization coverage and improved child health outcomes.

Keywords: Immunization, Completion, Childhood, Nasarawa, Community.

INTRODUCTION

Childhood immunization is a fundamental component of public health systems worldwide [1]. Vaccines have proven to be one of the most effective tools in reducing mortality and morbidity from infectious diseases. However, despite the proven benefits of immunization, various barriers continue to impede the global, national, and local efforts to ensure that all children receive their vaccines on schedule [2]. Globally, immunization services have improved access to essential vaccines for millions of children, contributing to the decline in child mortality rates and helping to eliminate certain vaccine-preventable diseases. However, sustaining and completing immunization schedules continue to pose major operational and systemic challenges [3]. Incomplete immunization leaves children vulnerable to preventable diseases and undermines the population-level benefits of herd immunity [4]. Furthermore, the global immunization agenda, including the Immunization Agenda 2030, identifies the need for country-led strategies that emphasize equity, integration, and sustainability in immunization delivery [5]. Yet, under-immunization remains a complex issue influenced by multifactorial elements such as parental awareness, trust in the health system, vaccine availability, socio-economic disparities, health workforce performance, and geographical accessibility [6].

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In Africa, progress in immunization has been uneven. While some countries have made remarkable achievements in increasing vaccine coverage and eradicating diseases like wild poliovirus, others still struggle with consistent delivery, full coverage, and follow-through on the complete schedule of childhood immunizations [7]. The region continues to report lower-than-global-average completion rates, which has led to the re-emergence of diseases that had once been significantly controlled. Several African countries contend with system-wide deficiencies such as logistical limitations, inadequate cold chain infrastructure, human resource shortages, vaccine stock-outs, and poor record-keeping practices [8]. Moreover, socio-cultural resistance to vaccination, fueled by misinformation and traditional beliefs, often affects caregivers' willingness to ensure timely and complete immunization of their children [9]. These dynamics compound the existing structural barriers and hinder the realization of full immunization coverage across the continent. In Africa, progress in immunization has been uneven. While some countries have made remarkable achievements in increasing vaccine coverage and eradicating diseases like wild poliovirus, others still struggle with consistent delivery, full coverage, and follow-through on the complete schedule of childhood immunizations [10]. The region continues to report lower-than-global-average completion rates, which has led to the re-emergence of diseases that had once been significantly controlled. Several African countries contend with system-wide deficiencies such as logistical limitations, inadequate cold chain infrastructure, human resource shortages, vaccine stock-outs, and poor record-keeping practices [11]. Moreover, socio-cultural

resistance to vaccination, fueled by misinformation and traditional beliefs, often affects caregivers' willingness to ensure timely and complete immunization of their children. These dynamics compound the existing structural barriers and hinder the realization of full immunization coverage across the continent [12 -13]

The North Central region of Nigeria is positioned second in terms of low vaccination coverage amongst the six geopolitical regions of the country, with merely 30% of children receiving complete immunizations, in contrast to 60.7% in the South-South. Even though the region benefits from adequate public health resources in Nigeria, childhood immunization completion rate remains 39% in the national level and 30% below desired levels, particularly in north Central Nigeria where the burden of vaccine-preventable diseases continues to pose a threat to child survival [14 -21]. Available data from national surveys and public health monitoring agencies have indicated that although many children receive at least one vaccine dose, a significant proportion fail to complete the full immunization schedule[15 -21). This trend undermines the intended impact of immunization programs, resulting in continued vulnerability to preventable diseases such as measles, polio, tuberculosis, and tetanus. Incomplete immunization not only weakens herd immunity but also places pressure on healthcare resources due to recurring disease outbreaks, particularly in under-resourced setting [16].

Nasarawa State reflects many of the challenges present in the broader Nigerian healthcare landscape. Although, the state has made progress in expanding immunization coverage, completion rates remain uneven across its senatorial districts with state completion rates of childhood immunization recorded as 29. 2 % being fully vaccinated according to national schedule and 42.3% fully vaccinated with routine Immunization basic antigens [17 -21]. Variations in service utilization, parental knowledge, sociocultural norms, health facility access, and the availability of vaccines all influence the level of immunization completion [18]. In several communities, mothers begin the immunization process for their children but do not return to complete the schedule [19 -21]. This interruption in care suggests the presence of systemic, social, and logistical challenges that have not been sufficiently addressed by current health policies and interventions [20].

MATERIALS AND METHODS

Study area

Nasarawa North Senatorial District in Nasarawa State, Nigeria, comprises of three Local Government Areas: Akwanga, Nasarawa Eggon, and Wamba, with a census 2006 Projected Population of 588,219 residents and 117,644 for children of 0 – 5years.Nasarawa State lies between latitudes 7°45'–9°25' N and longitudes 7°–9°37' E, sharing boundaries with Kaduna, Plateau, Taraba, Benue, Kogi States, and the Federal Capital Territory (FCT). The study was cross-sectional and community-based, conducted in Anwan Souji, Akwanga, Angwan Eggon Nasarawa Eggon and Sabo Kasuwa Wamba.

Study Population

Nasarawa North Senatorial District, located in Nasarawa State, Nigeria, comprises of three Local Government Areas: Akwanga, Nasarawa Eggon, and Wamba. The district has a Census 2006 Projected total population of 588.219 which population distribution by Local Government Areas: Akwanga, 198.900; Nasarawa Eggon, 261.498, Wamba, 127.820[22].

Sample Size determination

The sample size was determined using standard epidemiological formula as described by

$$n = \frac{z^{2}\ (a-1)pq}{d^{2}}$$

Where
n = The minimum sample size.
z^2= The standard normal deviate usually set at 1.96 which corresponds to 95% confidence interval.

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p = The proportion in the target population estimated to have a particular characteristic. According to a previous similar study carried out in North west Nigeria, Factor affecting childhood completion immunization

Using above formula, therefore:

q = 1.0-p

d = Degree of accuracy desired, usually set at 0.05.
Calculated from the formular[15]

z^2=1.96, p=40%(0.4), q=0.6, d=0.05.

If applied then, $n = \frac{1.96^2 \times 0.6 \times 0.4}{(0.05)^2} = 368.8$

In order to take care of attrition due to non-response 10% was added: $\frac{10}{100} \times 368.8 = 36.88$

368.8 + 36.88 = 405.68 ≈ **406**

The required minimum sample size for the study will be **406**.

In view of the above, a total of 403 caregivers with children age 0 -23 months were sampled using a questionnaire as follows; Angwan Souji, Akwanga =36, Angwan Eggon Nasarawa Eggon =35, Sabo KasuwaWamba = 32.

Ethical Approval

Ethical clearance wasobtained from Nasarawa state Health Research Ethics Committee under Nasarawa State Ministry of Health. Consent was acquired from the respondents throughout the period of study.

Inclusion criteria

All caregivers with children under 5 years, who registered for routine immunization amongst Selected communities in Akwanga, Nasarawa Eggon and Wamba LGA and all Caregiver with eligible children during the time of data collection were recruited in this study.

Exclusion criteria

The study excludes children above five years, individuals outside Nasarawa North, and communities not part of the identified population for analysis.

Sample Collection Procedures

Selective sampling system was used by sharing questionnaires to caregivers in household with odd number. 136 caregivers/parent were given Questionnaires in Angwan Souji, Akwanga LGA, 135 was given to caregivers/parents in Eggon community, Nasarawa Eggon LGA and 135 Questionnaires was shared to Caregivers/parents in Sabo Kasuwa, Wamba LGA.

Total number of 403 Questionnaires were retrieved from the Caregivers/ parent in Nasarawa North Senatorial Zone: 136 from Angwan Souji, Akwanga LGA, 135 from AngwanEggon community, Nasarawa Eggon LGA and 132 from Sabo kasuwa, Wamba LGA.

RESULTS AND DISCUSSION

A total of 403 children within 12-23 months of age with their caregiver were included in this study. The percentage distribution of the caregivers in relation to their socio-demographic, Socio-economic, socio-cultural, obstetrics and other factors were analyzed by use of descriptive statistics as shown in Table 1 and 2. Most notably, high percentage of caregivers in relation to socio-demographic factors were found to be within the age group; 25-34years (134, 33.3%), female (355, 88.1%), married (345, 85.6%) and secondary level of education (172, 42.7%). For Socio-economic factors, the percentage of self-employed (136, 33.7%) and low-income earner (229, 56.8%) were found to be highest. Also, the percentage of caregivers of the children in relation to socio-cultural factors, obstetrics and other factors was highest among those who have religious beliefs (342, 84.9%) and cultural beliefs (360, 89.3%) than those without religious beliefs (61, 15.1%) and cultural beliefs (43, 10.7%).

Table 1. Frequency of Caregiver in relation to their Socio-demographic characteristics

Socio – Demographic Factors	No. of Caregivers	Percentage (%)
Age		
15-24	91	22.6
25-34	134	33.3
35-44	128	31.8
≥45	50	12.4
Total	403	100
Gender		
Female	355	88.1
Male	48	11.9
Total	403	100
Marital Status		
Divorced	20	5
Married	345	85.6
Single	30	7.4
Widowed	8	2
Total	403	100
Level of Education		
Primary	58	14.4
Secondary	172	42.7
Tertiary	150	37.2
Non-Format Education	23	5.7
Total	403	100

Table 2. Frequency of Caregiver in relation to their Socio-economic, Socio-cultural and other characteristics

Factors	No. of Caregiver	Percentage (%)
Occupation		
Civil Servant	83	20.6
Housewife	117	29
Self-employed	136	33.7
Unemployed	67	16.6
Total	403	100
Income		
Low earner	229	56.8
Middle earner	142	35.2
High earner	32	7.9
Total	403	100
Religious Belief		
Yes	342	84.9
No	61	15.1
Total	403	100
Cultural Belief		
Yes	360	89.3
No	43	10.7
Total	403	100
Challenges		
AEFI	252	62.5
No vaccine	29	7.2
Distance of health Facility	20	5
Absence of Health worker	20	5
No Reminder	48	11.9
None	34	8.4
Total	403	100

Immunization coverage among children in relation to the Socio- demographic factors of the Caregiver

The overall proportion of children with caregiver who had complete immunization coverage was 301(74.7%). The complete immunization coverage of the children in relation to the socio-demographic, socio-economic, socio-cultural and other factors were analyzed by use of descriptive statistics (Table 3 and 4.) and the association of the complete immunization coverage of the children in relation to socio-demographic, socio-economic, socio-cultural and other factors were analyzed by use of Fisher exact test.

Table 3. Proportion of immunization coverage among children in relation to the Socio-demographic factors of the Caregiver

Scio - Demographic Factors	No. of Caregiver	Percentage (%) of Complete Immunization
Years		
15-24	91	63(69.2)
25-34	134	111(82.8)
35-44	128	92(71.9)
≥45	50	35(70.0)
Total	403	301(74.7)
Gender		
Female	355	266(74.9)
Male	48	34(70.8)
Total	403	301(74.7)
Marital Status		
Divorced	20	14(70.0)
Married	345	261(75.7)
Single	30	22(73.3)
Widowed	8	3(37.5)
Total	403	301(74.7)
Level of Education		
Primary	58	33(56.9)
Secondary	172	133(77.3)
Tertiary	150	114(76.0)
Non-Format Education	23	20(87.0)
Total	403	301(74.7)

Most notably, the full immunization coverage of the children in relation to age, gender, marital status and level of education of the caregivers were found to be highest within the age group 25-34 years (82.9%), female (74.9%), married (75.7%) and those with non-formal education (87.0%) but low among 15-24 years (69.2%), male (70.8%), widowed (37.5%) and primary level of education (56.9%) as shown in Table 3. The full immunization coverage of the children in relation to socio-economic, socio-cultural and other factors of their caregiver were also found to be high among the civil servant (89.2%), high-income earner (93.8%), those with religious (84.4%) and cultural (80.3%) belief; and without challenges (91.0%). The complete immunization coverage of the children were significantly associated with level of education (P=0.00166), income (P=0.03068) and challenges associated with immunization (P=0.01499), occupation ($P=1.205\times10^{-5}$), religious belief ($P=5.879\times10^{-9}$) and cultural belief ($P=1.807\times10^{-16}$) of the caregivers but insignificantly associated with the age (P=0.07191), gender (P=0.59910) and marital status (P=0.30850) of the caregivers.

Table 4. Proportion of immunization coverage among children in relation to the Socio-economic, socio-cultural and other factors of the Caregiver

Socio – Economic and Cultural Factors	No. of Caregiver	Percentage (%) of Complete Immunization
Occupation		
Civil Servant	83	74(89.2)
Housewife	117	70(59.8)
Self-employed	136	109(80.1)
Unemployed	67	48(71.6)
Total	403	301(74.7)
Income		
Low	229	159(69.4)
Middle	142	112(78.9)
High	32	30(93.8)
Total	403	301(74.7)
Religious Belief		
Yes	342	275(84.4)
No	61	26(42.6)
Total	403	301(74.7)
Cultural Belief		
Yes	360	289(80.3)
No	43	12(27.9)
Total	403	301(74.7)
Challenges		
AEFI	252	193 (76.6)
No vaccine	29	23(79.3)
Distance of Facility	20	16(80.0)
Absence of health worker	20	16(80.0)
No Reminder	48	21(43.8)
None	34	32(94.1)
Total	403	301(74.7)

DISUSSION

Immunization completion rate remains a major public health challenge in sub-Saharan Africa leading to most avoidable infections and deaths. In this study, childhood non-immunization completion rate in North Central Nigeria was found to be 60.7% which is significantly higher than 39.3% of South – South Nigeria according to [21 - 23). These percentage may be attributed to differences in healthcare access, demographic factors, Sociocultural factors and socio-economic conditions across the communities in Nasarawa North Senatorial District of Nasarawa State [24]. Across Nigeria, childhood immunization completion rate shows notable geographical disparities. For instance, in the North East, Kebbi, Sokoto and Zamfara States reported childhood immunization completion rate of 9.7%,8,4% and 9.6% respectively with the highest childhood immunization incompletion rates observed among children under five years old, mirroring this study's findings[21 -25]. Conversely, in South -South, Cross rivers and Delta States reported a Childhood immunization rate of 68.6% and 68.1% respectively reflecting an improved healthcare awareness and infrastructure [21]. Findings from the study indicated that the education level of the parents/caregivers was significantly associated with completion of immunization schedules of their children, as shown by the increasing likelihood of completion with increasing education level [26], The likelihood of completion of immunization schedule among the parents with primary education was almost 2 times that of those with non - Formal education, while that of children of parents who completed secondary education was 4 times higher than those with non - formal education. The likelihood of completion of immunization schedule among children of mothers with higher education was significantly higher than among those with non-Formal education, but was slightly lower among mothers who had completed secondary education and 2 times higher than primary education[27]. This may have resulted from the smaller number of participants in the sample who had completed higher education. This finding could also mean that whether mothers/caregivers were educated was what mattered in influencing their decision to ensure completion of their children's immunization schedules, rather than what level of education they attained[28].

According to the findings of this research, income level is a significant predictor of completion of routine immunization schedules in Nasarawa North Senatorial district of Nasarawa State as evidenced by the increased completion of immunization schedules by children [29]. As indicated that parents/caregivers of high-income level have a high chance of completing their children immunization schedules than parents/caregivers of middle-income level and the parent/caregivers of low-income level has the lowest chance of completion of their children routine immunization among the three income levels[30]. The findings above demonstrated that Caregivers with high income level has means of transporting their children to distance facilities for routine immunization whenever facilities close to them run short of vaccines, higher income earners regularly visit health facilities for their children check- up because source income is not problem while low-income earner find it difficult pay transport for regular visit of their children routine immunization schedule [31].

The completion of routine immunization schedules in Nasarawa North- Senatorial district of Nasarawa State, the initial association failed to remain significant after controlling for covariates, hence, not a significant factor in influencing the completion or otherwise of immunization schedules among the children of mothers with full autonomy when compared to their counterparts whose mothers have some autonomy[32]. Autonomy has been described as the freedom of decision making of a woman independently on things that affect her or her children (33 -34). The findings from this study are in contrast to findings from other studies on the influence of mother's autonomy on the health of their children including immunization coverage [35 -36]. There were studies from India and Nepal on women's decision making and child health: Familial and social hierarchies, in which they found increasing use of emergency or preventive health care services including children's immunization with increasing women's autonomy

even among women with less autonomy [37]. The findings from this study indicated a very high statistically significant relationship between the immunization schedule completion among children of parents with Adverse events following Immunization (AFEI) and Children of Parents without adverse events following Immunization in Communities of Nasarawa Noth Senatorial District, Nasarawa state and hence, AFEI is a significant predictor of completion of routine immunization schedules in Nasarawa North Senatorial district of Nasarawa state [38]. Adverse event following immunization in this study indicated 62% due to first dose of BCG and first dose of Penta valence vaccine introduced into a child that gave room to high drop -out rate. Therefore health workers should health educate parents/caregivers on management of Adverse events following immunization to avoid immunization drop-out rate ("Items Where Year Is 2015 - Publications of the IAS Fellows").

Conclusion

The primary aim of this study is to investigate whether there are significant statistical associations between the variables outlined in the research questions and the completion of immunization schedules amongst children in the Nasarawa North Senatorial District of Nasarawa State. The intention is to provide valuable insights for government officials, policymakers, program developers, and community members, enabling them to make informed decisions to tackle the issue of inadequate immunization coverage in the area. The results of the study indicate a statistically significant relationship between **six** variables Age group, Marital status, Education, Income Earning**,** Adverse Events Following Immunization, and health facility distance and the completion of immunization schedules. Consequently, it is essential for immunization stakeholders to address various socio-cultural, economic, and health system factors that significantly influence the completion of immunization schedules for children in the region. Additionally, it is crucial to confront the challenges faced by parents and caregivers, including their educational background, family income status, the costs associated with healthcare services (vaccination), occupation of the caregivers, cultural belief of the caregivers which have been identified as having a statistically significant impact on the completion or non-completion of routine immunization schedules. This can be achieved through targeted initiatives.

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