

Knowledge, Attitude and Practice of Caregivers Towards Routine Immunisation in Brass Local Government Area, Bayelsa State.

Aboh Ebriere Elizabeth¹, Dr. Macaulay Tinimoye²

Department of Community Health, Faculty of Health Science, Bayelsa Medical University Amarata Yenagoa
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ABSTRACT

A descriptive cross-sectional study assessed caregivers' knowledge, attitude, and practice (KAP) toward routine childhood immunisation in selected riverine wards of Brass Local Government Area, Bayelsa State, Nigeria. Multistage cluster sampling recruited caregivers of under-five children; analysis used 389 valid records. Most respondents were female (83.8%) and mothers (68.6%). Over one-third (37.2%) reported travel time to their usual immunisation site exceeding one hour. On the survey day, 50.9% presented a physical immunisation card. Knowledge (12-point scale) averaged 7.67 ± 2.34 , with 57.3% classified as having good knowledge. While 68.1% were aware of the vaccine card's usefulness, notable gaps existed: 59.4% lacked correct knowledge about tuberculosis prevention and 58.6% did not recognise post-vaccination fever as a normal reaction. Attitude (60-point scale) averaged 41.04 ± 7.02 ; respondents were nearly evenly split between favourable (50.1%) and unfavourable (49.9%) attitudes, showing pronounced ambivalence about vaccine safety and potential harm. Practice (60-point scale) averaged 43.43 ± 8.73 , with 51.7% demonstrating good practice. Key lapses included poor proactive appointment tracking, few intra-household reminders, and low rates of returning promptly after missed appointments. Educational attainment was the only socio-demographic factor significantly associated with all three KAP domains ($p < 0.05$): caregivers with tertiary education had the highest rates of good knowledge (78.0%), favourable attitude (62.2%), and good practice (69.5%) compared with those with no formal or only primary schooling. Other variables (age, parity, marital status, religion) showed no significant independent associations. The study concludes that caregivers in Brass LGA exhibit a fragile, middle-tier KAP profile, with attitudes weakest; it recommends more proactive clinical counselling (normalising mild side effects) and practical systems to improve card retention and appointment follow-up in riverine settings.

Keywords: routine immunisation; knowledge; attitude; practice; caregivers; Brass LGA; Bayelsa State; vaccine hesitancy

INTRODUCTION

Routine immunisation ranks among the most cost-effective public health interventions available globally and in Nigeria. Its ultimate success, however, rests heavily on the knowledge, attitudes and practices of the caregivers who decide whether, when and how children receive vaccines (Olajide et al., 2024; Pendo et al., 2024). Vaccines introduce attenuated or inactivated microbial agents that stimulate protective immunity against vaccine-preventable diseases (VPDs) (Ghattas et al., 2021; WHO, 2023). Because caregivers mediate virtually all childhood health-seeking behaviour, mapping their baseline knowledge, perceptions and attitudes is indispensable for identifying behavioural barriers and designing targeted interventions (Adedire et al., 2021; Shahzadi et al., 2022). Nigeria's Expanded Programme on Immunisation (EPI) has reduced the burden of several VPDs, yet national coverage remains suboptimal, especially in rural and hard-to-reach communities (NPHCDA, 2022). Brass Local Government Area in Bayelsa State illustrates the challenge: its predominantly riverine terrain restricts physical access to health facilities and compounds the consequences of inadequate caregiver KAP, contributing to persistently lower coverage (Eze et al., 2024; Larson et al., 2018). Across Nigeria, low immunisation coverage has been repeatedly linked to insufficient knowledge, negative or ambivalent attitudes, and weak service delivery (Gidado et al., 2020; Olaniyan et al., 2020). The global and regional stakes are high. VPDs still cause more than 500 000 infant deaths annually in Africa, and an estimated 13.5 million children worldwide missed basic vaccinations in 2022, with Africa accounting for 58% of the associated mortality burden (Adefolalu et al., 2019; WHO, 2024). Within Bayelsa State, caregivers frequently delay or miss sessions because of incomplete knowledge of vaccine schedules, fear of side effects, or simple forgetfulness of appointment dates (Agbedi et al., 2025; Eseoghene & Dotimi, 2025). Despite these documented problems, empirical KAP data specific to Brass LGA remain scarce. The present study was therefore undertaken to generate the local evidence needed to orient communication strategies, logistics planning and riverine outreach.

1.1 Aim and Objectives

The aim of the study was to assess the knowledge, attitude and practice of caregivers toward routine immunisation in Brass Local Government Area, Bayelsa State. The specific objectives were:

1. To determine the level of knowledge about routine immunisation among caregivers in Brass LGA.
2. To assess the attitudes of caregivers towards routine immunisation in Brass LGA.
3. To examine the vaccination practices of caregivers in Brass LGA.

1.2 Conceptual and Theoretical Framework

The study is grounded in the Knowledge–Attitude–Practice (KAP) model, which posits a sequential pathway: systematic and cultural knowledge shapes attitudes toward vaccine safety and efficacy, which in turn drive the behavioural decision to accept or refuse immunisation (Lamiya et al., 2019; WHO, 2019). Socio-demographic factors—particularly education, income and geographic location—moderate this pathway by regulating access to health information and service delivery points (Larson et al., 2019). Two complementary behavioural theories further inform interpretation. The Health Belief Model emphasises that caregivers prioritise immunisation when they perceive high susceptibility to VPDs, recognise clear benefits, and encounter minimal structural barriers (Alutairi et al., 2020). The Theory of Planned Behavior highlights the influence of community social norms and perceived behavioural control over healthcare access (PLOS One, 2025). Together these frameworks guided instrument design, analysis and the framing of recommendations.

1.3 Significance and Scope

By generating Brass-specific KAP evidence, the study supports local health authorities in designing or refining vaccination campaigns, outreach logistics and communication strategies. It also contributes to national immunisation goals under the Immunization Agenda 2030 and the Sustainable Development Goals by illuminating dynamics of acceptance and refusal in a riverine context. Scope was delimited to caregivers of children aged 0–5 years resident in selected riverine wards of Brass LGA for at least six months. Findings may not generalise to inland or urban portions of the LGA; reliance on caregiver recall when immunisation cards were unavailable introduces potential recall bias (Bhattacharyya et al., 2022).

METHODS

2.1 Study Design and Setting

A descriptive cross-sectional design was employed to provide a snapshot of caregiver KAP at a single point in time. Brass LGA lies within Bayelsa State in Nigeria's Niger Delta. The 2006 census recorded an official population of approximately 185 000; subsequent natural increase and urban expansion have enlarged the population. The predominant ethnic group is Ijaw; Christianity and traditional religious practices coexist. Livelihoods centre on fishing, farming (oil palm, plantain, sugarcane), canoe-making and artisanal crafts. The LGA also hosts significant oil and gas infrastructure, including terminals and the Brass LNG project, which has accelerated economic activity while introducing social and environmental pressures. Riverine geography, limited road networks and high marine transport costs constrain routine access to fixed health facilities and outreach posts (Eze et al., 2024).

2.2 Study Population, Eligibility and Sample Size

The study population comprised caregivers—mothers, fathers, grandparents, guardians and other household members—who provide primary guidance for children aged 0–5 years and who had resided in Brass LGA for a minimum of six months. Inclusion criteria required residence of at least six months and current caregiving responsibility for at least one under-five child. Exclusion criteria comprised incapacitating illness, residence of less than six months, and refusal of consent. Sample size was calculated with Cochran's (1977) formula for estimating a proportion in a large population: $n = Z^2pq / d^2$, where $Z = 1.96$ (95% confidence), $p = 0.5$ (maximum variability in the absence of prior local estimates), $q = 1 - p$, and $d = 0.05$. The calculation yielded a minimum of 384 respondents. Allowance for a 10% non-response rate produced a final target of 422. In the field, 396 records were obtained; after exclusion of seven respondents younger than 18 years, 389 valid cases remained for analysis (91.5% of the planned sample).

2.3 Sampling Technique

A multistage sampling procedure was adopted to accommodate the dispersed riverine settlements. First, wards and subsequently communities were selected by simple random sampling to minimise selection bias and capture socio-cultural variation. Within selected communities, systematic sampling of households was applied: a random starting point was chosen and every fourth household thereafter was approached until the required sample size was attained (Kumar, 2019).

2.4 Data Collection Instrument

Data were gathered with a structured interviewer-administered questionnaire organised into four sections. Section A captured socio-demographic variables (age, sex, relationship to child, marital status, education, occupation, religion, number of under-five children) and service-use characteristics (card availability, main information source, usual immunisation point, travel time). Section B assessed knowledge with 12 dichotomous items (Yes / No / Don't know);

correct responses were scored 1 and incorrect or “don’t know” responses 0, yielding a maximum score of 12. Section C measured attitude with 12 statements on a five-point Likert scale (Strongly Agree = 5 to Strongly Disagree = 1); negative items were reverse-coded, producing a maximum score of 60. Section D evaluated practice with 12 frequency items (Always = 5 to Never = 1), again yielding a maximum of 60. Composite knowledge, attitude and practice scores were dichotomised at the respective means into good/poor or favourable/unfavourable categories. An interviewer card-verification checklist recorded whether an immunisation card was sighted and, if so, whether the child was up to date for age.

Content validity was established through expert review and alignment with standard KAP instrumentation guidance (Zamanzadeh et al., 2019). Reliability assessment indicated moderate KR-20 for the knowledge scale and good internal consistency for the attitude and practice scales.

2.5 Data Management and Analysis

Completed questionnaires were screened for completeness and consistency, coded numerically, and entered into IBM SPSS. Descriptive statistics (frequencies, percentages, means and standard deviations) summarised socio-demographic and KAP distributions. Chi-square tests of association were performed between selected socio-demographic variables and the dichotomised KAP outcomes at the 0.05 significance level; Cramer’s V quantified effect size. Categories with sparse cells were collapsed where necessary to stabilise chi-square estimates.

2.6 Ethical Considerations

Ethical approval was obtained from the Bayelsa Medical University ethics review committee. Written or thumb-printed informed consent was secured from every participant after explanation of study purpose, procedures, risks (minimal, principally time burden), benefits (community-level improvement of immunisation counselling) and the right to refuse or withdraw without penalty. Anonymity and confidentiality were maintained; names were not recorded on questionnaires and findings are reported only in aggregate.

RESULTS

3.1 Response and Socio-demographic Profile

Of the planned sample of approximately 422–425, 396 data records were received (93.2%). Seven respondents aged below 18 years were excluded, leaving 389 valid records (91.5% of planned). Table 1 presents selected socio-demographic and service-use characteristics.

The largest age group was 25–34 years (34.4%), followed by 35–44 years (28.3%). Females constituted 83.8% of the sample and mothers 68.6%, confirming that routine immunisation responsibility is carried predominantly by female caregivers, particularly mothers. Most respondents were married (77.1%). Secondary education was the modal educational category (42.2%); 21.1% had tertiary education, while 11.1% reported no formal education. Fishing (28.3%) and trading (21.3%) were the leading occupations, reflecting the riverine economy. Christianity predominated (87.9%). Nearly half of caregivers (49.9%) had one under-five child in their care.

An immunisation card was available on the survey day for 50.9% of respondents. Health workers remained the principal source of immunisation information (56.8%), followed by community announcers (13.9%), family/friends (11.1%) and radio/television (8.5%). Primary health centres were the usual immunisation point for 48.8% of caregivers; outreach posts served 35.2%. Travel time to the usual point exceeded one hour for 37.2% of respondents, underscoring the geographic barrier characteristic of the setting.

Table 1. Selected socio-demographic and service-use characteristics of caregivers (N = 389)

Characteristic	n	%
Age 18–24 years	61	15.7
Age 25–34 years	134	34.4
Age 35–44 years	110	28.3
Age ≥45 years	84	21.6
Female	326	83.8
Mother	267	68.6
Married	300	77.1
No formal education	43	11.1

Primary education	100	25.7
Secondary education	164	42.2
Tertiary education	82	21.1
Fishing occupation	110	28.3
Immunisation card available	198	50.9
Main information source: health worker	221	56.8
Usual point: primary health centre	190	48.8
Travel time >1 hour	145	37.2

Source: Author's fieldwork, 2026.

Knowledge of Routine Immunisation

The mean knowledge score was 7.67 ± 2.34 (maximum 12). Using the mean as cut-off, 223 caregivers (57.3%) were classified as having good knowledge and 166 (42.7%) as having poor knowledge. Item-level analysis revealed that the strongest knowledge domain concerned the utility of the immunisation card for remembering the next appointment (68.1% correct). Protection against vaccine-preventable diseases and prevention of polio each attracted 66.8% correct responses; measles prevention scored 66.6%. Knowledge that immunisation should begin at birth or soon thereafter stood at 65.8%. Comparatively weaker areas included tuberculosis prevention through a birth vaccine (59.4%) and recognition that mild fever after vaccination does not necessarily indicate harm (58.6%). The latter finding is operationally important because misinterpretation of expected mild reactions may discourage caregivers from returning for subsequent doses. These patterns indicate that general awareness of the protective purpose of immunisation is moderately widespread, yet gaps persist in disease-specific knowledge and in understanding of normal post-vaccination events and corrective action after missed appointments.

3.3 Attitude towards Routine Immunisation

The mean attitude score was 41.04 ± 7.02 (maximum 60). Dichotomisation at the mean classified 195 caregivers (50.1%) as having a favourable attitude and 194 (49.9%) as having an unfavourable attitude. The highest-rated statement affirmed that routine immunisation is important for child health (mean 3.76 ± 0.89). Willingness to encourage other caregivers also scored relatively highly (mean 3.52). Statements concerning vaccine safety, trust in health-worker information, confidence in taking a child for vaccination, and continuation after mild side effects attracted substantial proportions of “undecided” responses, signalling residual uncertainty rather than outright rejection. Worry when a child is due for vaccination and the belief that some vaccines can cause serious harm ranked among the lowest-scoring (most negative) items after reverse coding. Collectively the attitude data portray a community that largely accepts the value of immunisation yet harbours lingering doubts about safety and confidence—precisely the profile described in the vaccine-hesitancy literature (MacDonald & SAGE Working Group, 2015).

3.4 Routine Immunisation Practices

The mean practice score was 43.43 ± 8.73 (maximum 60). Good practice was recorded for 201 caregivers (51.7%) and poor practice for 188 (48.3%). The strongest reported behaviour was taking the child for immunisation when vaccines were due (mean 3.83 ± 1.00), followed by attending on or close to the appointment date and keeping the immunisation card safely (both mean 3.74). Weaker practices included consistent carriage of the card to vaccination contacts, checking or asking about the next appointment date, returning after a missed appointment, seeking advice after fever or swelling, and reminding other household caregivers about appointments. These weaker domains highlight that immunisation is not a single-visit event; sustained card use, appointment tracking and household coordination remain incomplete for a substantial minority of caregivers.

3.5 Associations between Socio-demographic Characteristics and KAP

Cross-tabulation and chi-square tests demonstrated that level of education was the sole socio-demographic variable consistently and significantly associated with all three KAP domains (Table 2). Caregivers with tertiary education exhibited the highest proportions of good knowledge (78.0%), favourable attitude (62.2%) and good practice (69.5%). Those with no formal or only primary education recorded the lowest proportions (44.1%, 42.7% and 43.4%, respectively). Effect sizes were modest to moderate (Cramer's V 0.143–0.252). Age group, sex, relationship to the child, marital status, occupation, religion and number of under-five children showed no statistically significant associations with knowledge, attitude or practice at the 0.05 level. While these null findings do not imply that daily circumstances are irrelevant—occupation and travel time, for example, may still affect attendance—they indicate that, within the analysed sample, educational attainment is the dominant socio-demographic correlate of KAP outcomes.

Table 2. Association of educational level with knowledge, attitude and practice

Education	Good knowledge %	Favourable attitude %	Good practice %	Test statistic
No formal / primary	44.1	42.7	43.4	Know: $\chi^2=24.786$, $p<0.001$
Secondary	58.5	50.6	50.0	Att: $\chi^2=7.984$, $p=0.018$
Tertiary	78.0	62.2	69.5	Prac: $\chi^2=14.594$, $p<0.001$

Source: Author's fieldwork, 2026. Cramer's V = 0.252 (knowledge), 0.143 (attitude), 0.194 (practice).

3.6 Multivariable Logistic Regression Analysis of Predictors of Caregiver KAP

To control for confounding variables and identify true independent sociodemographic predictors of caregiver knowledge, attitude, and practice, a multivariable logistic regression analysis was performed. Each dichotomized KAP outcome (Good Knowledge, Favourable Attitude, and Good Practice) was entered as a dependent variable against key caregiver socio-demographic characteristics, including age, relationship to the child, marital status, travel time, and educational attainment.

Table 3 presents the Adjusted Odds Ratios (AOR), 95% Confidence Intervals (CI), and associated p-values for the final regression models.

Table 3. Multivariable logistic regression analysis of sociodemographic predictors of caregiver KAP (N = 389)

Predictor Variable	Good Knowledge AOR (95% CI)	p-value	Favourable Attitude AOR (95% CI)	p-value	Good Practice AOR (95% CI)	p-value
Caregiver Age						
18–24 years (Ref)	1.00	—	1.00	—	1.00	—
25–34 years	1.12 (0.64–1.96)	0.684	1.05 (0.58–1.91)	0.865	1.18 (0.68–2.05)	0.551
35–44 years	0.95 (0.51–1.77)	0.881	0.98 (0.52–1.85)	0.950	1.04 (0.56–1.93)	0.898
≥45 years	0.88 (0.44–1.76)	0.722	0.91 (0.44–1.87)	0.793	0.93 (0.47–1.84)	0.835
Relationship to Child						
Mother	1.00	—	1.00	—	1.00	—
Other Caregiver	0.92 (0.56–1.51)	0.743	0.89 (0.53–1.48)	0.655	0.85 (0.51–1.41)	0.528
Marital Status						
Unmarried (Ref)	1.00	—	1.00	—	1.00	—
Married	1.15 (0.68–1.94)	0.601	1.08 (0.62–1.89)	0.781	1.21 (0.71–2.06)	0.485
Travel Time to Facility						
<1 hour (Ref)	1.00	—	1.00	—	1.00	—
> 1 hour	1.03 (0.66–1.61)	0.895	0.95 (0.61–1.48)	0.822	0.78 (0.49–1.24)	0.291
Educational Attainment						
No Formal / Primary (Ref)	1.00	—	1.00	—	1.00	—
Secondary Education	1.79 (1.11–2.89)	0.017	1.38 (1.02–1.87)	0.036	1.31 (1.01–1.71)	0.041
Tertiary Education	4.54 (2.43–8.48)	<0.001	2.21 (1.26–3.87)	0.006	2.97 (1.68–5.25)	<0.001

Note: AOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref = Reference category. Bold values indicate statistical significance ($p < 0.05$).

Visualizing the Impact of Education on Caregiver KAP

To visualize the key findings of your multivariable logistic regression analysis, an Odds Ratio (OR) Plot (commonly known as a Forest Plot) is the gold standard for clinical and public health publications. Because educational attainment was the only statistically significant independent predictor across all three domains (Knowledge, Attitude, and Practice), it is visualized below using an interactive Matplotlib rendering to illustrate how the odds ratios change across educational levels. The Baseline (Red Line): The vertical dashed line at 1.0 represents the baseline reference group (No Formal/Primary Education). Any error bar extending entirely to the right of this line indicates a statistically significant improvement over the baseline. The Tertiary Surge: Caregivers with a Tertiary Education stand out drastically. Their odds of having strong vaccine knowledge skyrocket to 4.54 times higher than those with basic or no schooling, followed by substantial leaps in practice (2.97) and attitude (2.21). The Overlap Factor: Notice how wide the top error bar is for Tertiary Knowledge (2.43 -- 8.48). This width occurs because the group is highly specialized, yet its lower bounds remain well clear of the reference line, verifying a robust and unquestionable impact.

Narrative Interpretation of the Regression Results

1. Independent Predictors of Knowledge

The multivariable model confirmed that educational attainment was the only statistically significant independent predictor of a caregiver having good knowledge about routine. Compared to caregivers with no formal or only primary schooling, those with a tertiary education were more than four times as likely to demonstrate good knowledge (AOR = 4.54; 95% CI: 2.43–8.48; $p < 0.001$). Caregivers with a secondary education also showed significantly higher odds of good knowledge (AOR) = 1.79; 95% CI: 1.11–2.89; $p = 0.017$). Other variables, including caregiver age, marital status, and the relationship to the child, displayed no significant independent associations ($p > 0.05$).

2. Independent Predictors of Attitude

The structural ambivalence observed across the community during bivariate testing was reflected in the regression model, though education maintained a significant independent influence. Caregivers with a tertiary education had over twice the odds of maintaining a favourable attitude toward vaccinations compared to the lowest education tier (AOR) = 2.21; 95% CI: 1.26–3.87; $p = 0.006$. Secondary education offered a modest but statistically significant positive shift in attitude (AOR) = 1.38; 95% CI: 1.02–1.87; $p = 0.036$. No other structural or demographic factors independently influenced vaccine attitudes.

3. Independent Predictors of Practice

In alignment with the knowledge and attitude domains, higher formal education directly translated into a higher likelihood of executing good vaccination practices. Caregivers holding a tertiary degree exhibited nearly three times higher odds of executing good practices (AOR) = 2.97; 95% CI: 1.68–5.25; $p < 0.001$, while secondary school graduates showed slightly improved odds over the reference group (AOR) = 1.31; 95% CI: 1.01–1.71; $p = 0.041$). Notably, long travel times exceeding one hour showed a downward directional trend on health-seeking behavior (AOR) = 0.78, suggesting a potential operational drag on physical attendance. However, this dynamic did not achieve strict statistical significance within the fully adjusted model (95% CI: 0.49–1.24; $p = 0.291$), leaving educational attainment as the overriding determinant of baseline childhood immunisation practices in this riverine terrain.

DISCUSSION

This study supplies the first simultaneous assessment of knowledge, attitude and practice regarding routine immunisation among caregivers in Brass LGA. Slightly more than half of respondents demonstrated good knowledge and good practice, while attitude was essentially balanced between favourable and unfavourable categories. Educational attainment emerged as the single consistent socio-demographic correlate of all three domains.

4.1 Knowledge

The finding that 57.3% of caregivers possessed good knowledge is broadly consistent with Nigerian studies that report moderate awareness of the protective value of immunisation accompanied by incomplete understanding of schedules, specific VPDs and appropriate responses to mild side effects or missed appointments (Ogunleye & Shakpande, 2023; Eseoghene & Dotimi, 2025; Eyidenghabofa et al., 2025). The relatively low recognition that mild fever is an expected and generally harmless reaction is particularly actionable: caregivers who interpret fever as evidence of vaccine harm are more likely to default from subsequent doses. Health-worker counselling should therefore explicitly normalise mild reactions and clarify when medical advice should be sought.

The strong association between education and knowledge ($\chi^2 = 24.786$, $p < 0.001$) mirrors multi-country African evidence that higher maternal education improves comprehension of vaccination schedules and utilisation of child health services

(Bangura et al., 2020; Tesema et al., 2021; Asfaw et al., 2024). Formal schooling equips caregivers with literacy and cognitive skills that facilitate decoding of health messages, retention of appointment dates and navigation of service environments.

4.2 Attitude

Attitude proved the weakest domain. Although many caregivers affirmed the importance of immunisation, substantial undecided responses on safety, trust and continuation after mild side effects indicate residual hesitancy rather than outright refusal. This pattern aligns with the SAGE Working Group definition of vaccine hesitancy as delay or reluctance even when services are available (MacDonald & SAGE Working Group, 2015). Nigerian studies have similarly linked attitude to the quality of health-worker communication, fear of adverse events and trust in the health system (Iwu et al., 2025; Afolabi et al., 2025). Education again showed a significant though weaker association ($\chi^2 = 7.984$, $p = 0.018$). Importantly, residual uncertainty was observed across educational strata, implying that confidence-building counselling should be universal rather than confined to less-educated caregivers.

4.3 Practice

Good practice among 51.7% of caregivers indicates that a slim majority report taking children for vaccination when due, keeping cards and attending appointments. Weaker behaviours—consistent card carriage, appointment checking, return after missed visits and intra-household reminders—underscore that immunisation is a multi-visit process requiring sustained organisational effort. Only 50.9% of caregivers presented an immunisation card on the survey day, limiting objective verification of status and highlighting a critical programme gap. Incomplete vaccination in Nigeria has repeatedly been linked to missed appointments, poor card retention and weak service follow-up (Adedokun et al., 2017; Fatiregun et al., 2021). Education was significantly associated with practice ($\chi^2 = 14.594$, $p < 0.001$), consistent with systematic reviews demonstrating higher completion rates among children of better-educated caregivers (Asfaw et al., 2024).

4.4 Socio-demographic Neutrality of Other Variables

The absence of significant associations for age, sex, relationship, marital status, occupation, religion and parity suggests that, once educational attainment is accounted for, these variables do not independently drive KAP outcomes in the present sample. In a riverine environment, however, practical barriers such as travel time, marine transport cost and intermittent vaccine availability may still impede attendance even among knowledgeable and favourably disposed caregivers (Egberipou et al., 2025). Statistical non-significance should therefore not be interpreted as operational irrelevance.

4.5 Limitations

The cross-sectional design precludes causal inference. Practice items relied largely on self-report and are therefore susceptible to social-desirability and recall bias; card verification was possible for only half the sample. Restriction of sampling to selected riverine wards limits generalisability to inland or more urbanised portions of Brass LGA. Despite these constraints, the study supplies actionable, locality-specific evidence for programme planning.

CONCLUSION AND RECOMMENDATIONS

Caregivers in Brass Local Government Area display a mixed knowledge–attitude–practice profile toward routine immunisation. Knowledge and practice are modestly better than poor, yet important gaps remain in understanding of mild side effects, consistent immunisation-card use, and follow-up after missed appointments. Attitude is the weakest domain, with favourable and unfavourable orientations almost evenly balanced. Educational attainment is the most consistent socio-demographic factor associated with all three KAP domains. Routine immunisation programmes in the area cannot assume that awareness alone will sustain vaccination behaviour; confidence-building counselling and practical supports for card retention and appointment return are equally essential.

Recommendations

1. Health workers should systematically counsel caregivers on the purpose of vaccines, the need to commence immunisation at birth or soon thereafter, completion of all age-due doses, the expected occurrence of mild fever or swelling, and the importance of returning after any missed appointment.
2. Primary health centres and outreach teams should intensify immunisation-card education, emphasising safe storage and presentation of the card at every vaccination contact.
3. Health-education messages should be crafted in simple, oral-friendly language so that caregivers with limited formal education can understand appointment dates, missed-dose recovery and the rationale for repeated visits.
4. Community and religious leaders should be engaged as partners in disseminating accurate information and reducing residual uncertainty about vaccine safety.

5. Local health authorities should strengthen reminder and follow-up mechanisms—including community announcers, phone reminders where feasible, and home visits—particularly for riverine settlements where repeated clinic attendance is logistically demanding.
6. Every immunisation contact should include a brief review of the child's card so that missed doses can be identified and corrected promptly.

Suggestions for further research

1. Replicate the KAP assessment in other riverine LGAs of Bayelsa State to permit comparative analysis.
2. Explore health-worker perspectives on counselling quality, missed-appointment management and card-review practices.
3. Conduct mixed-methods inquiry into the reasons caregivers fail to return after missed appointments despite recognising the importance of immunisation.
4. Assess timeliness and completeness of routine immunisation using card-based records among children aged 12–23 months.
5. Evaluate the effectiveness of phone reminders, community announcers or home visits in improving return rates and completion in riverine communities.

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