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CHRONOLOGICAL AGE, KNOWLEDGE AND PRACTICE OF CHILD IMMUNIZATION AMONG NURSING MOTHERS IN ZANGON KATAF LOCAL GOVERNMENT AREA OF KADUNA STATE

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ABSTRACT
This study investigates the influence of maternal chronological age on the knowledge and practice of child immunization among nursing mothers in Zangon Kataf Local Government Area, Kaduna State. Employing a survey research design, data were gathered from a proportionate stratified random sample of 198 registered nursing mothers across 11 council wards using a validated structured questionnaire (Cronbach's alpha = 0.81). Data were analysed using descriptive statistics (mean scores) and inferential statistics (one-way ANOVA and Tukey's HSD post-hoc tests) at the 0.05 level of significance. The findings reveal a progressive, statistically significant positive linear relationship between maternal chronological age, immunization knowledge, and practice adoption ($p < 0.05$). Mothers aged 31 years and above demonstrated high and adequate knowledge and practice scores, driven by cumulative parity and repeated healthcare exposure. Conversely, mothers under 20 years exhibited significant deficits in both knowledge and practice, while those aged 21–30 years revealed a pronounced knowledge-practice gap possessing adequate theoretical knowledge (2.96) but inadequate actual practice (2.01) due to structural barriers, domestic workloads, and health system hurdles. The study concludes that chronological age is a critical structural determinant of childhood immunization uptake. It is recommended that health planners deploy youth-friendly clinic services, mobile outreach, and household engagement strategies. Furthermore, future researchers should audit facility health registers and utilize multivariable regression models to control for confounding sociodemographic factors.

Keywords: knowledge, practice, child immunization and nursing mothers

Introduction

Maternal immunization practice encompasses the behaviors, decisions, and beliefs that shape a mother's approach to vaccinating her child. Achieving complete immunization before a child's first birthday relies heavily on a mother's understanding of vaccine benefits, schedules, and available services (Ajayi, 2021; Solagbade, 2023). Knowledge, Attitude, and Practice (KAP) studies offer valuable insights into community awareness and healthcare habits; however, evidence shows that maternal knowledge in many developing regions remains superficial (Smith & Johnson, 2020). For instance, misconceptions persist regarding vaccine types such as mistaking oral polio vaccine for vitamins and the required number of doses (Mojoyinola & Olaleye, 2019). While studies in Kenya and Nigeria demonstrate that most mothers recognize the general importance of vaccination, specific gaps in schedule timing and disease prevention remain widespread (Abdullahi et al., 2018; Owino et al., 2019).

Even when parents possess basic information, operational barriers, low literacy, and socio-demographic factors can hinder timely vaccination (Abdulraheem et al., 2019; Joseph et al., 2022). Attributes such as parental income level, education, and geographic location are well-documented determinants of negative immunization practice (Ayuba et al., 2022; Okedo-Alex et al., 2020). However, the specific influence of a mother's chronological age remains multifaceted and comparatively underexplored. Younger mothers often face challenges related to limited experience and lower confidence in healthcare decisions, whereas older mothers typically benefit from greater experience and better healthcare access (Alex et al., 2020).

Despite extensive research on socioeconomic status and education, there is a notable scarcity of literature examining chronological age as a distinct of child immunization knowledge and practices. To address this empirical gap, this study examines chronological age differences on the knowledge and practice of child immunization among nursing mothers in the Zangon Kataf Local Government Area of Kaduna State.

Purpose of the Study

The aim of this study was to examines chronological age differences on the knowledge and practice of child immunization among nursing mothers in the Zangon Kataf Local Government Area of Kaduna State, Nigeria. Specifically, the study aims to:

i. examines chronological age differences on the knowledge of child immunization among nursing mothers in the Zangon Kataf Local Government Area of Kaduna State
ii. examines chronological age differences on the practice of child immunization among nursing mothers in the Zangon Kataf Local Government Area of Kaduna State

Research question

1. What is the level of knowledge of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age?
2. What is the level of practice of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age?

Research Hypotheses

i. There is no significant difference in the level of knowledge of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age.
ii. There is no significant difference in the practice of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age.

Methodology

A survey research design was used for this study, the target population for this study comprised 910 nursing mothers registered for routine child immunization and postnatal services across the Primary Health Care (PHC) centres in the 11 council wards of Zangon Kataf Local Government Area (LGA). This baseline population figure was obtained from the

Health Management Information System (HMIS) records and Child Immunization Registers of the respective PHC facilities (2025/2026).

A proportionate stratified random sampling technique was used to select a sample size of 198 respondents. The 11 council wards served as strata, from which sample size was allocated proportionately based on the population size of registered nursing mothers in each ward. Subsequently, the simple random sampling technique using the lottery ("dip-and-pick") method was applied within each stratum (ward) to select individual participants.

The research instrument was a self-structured questionnaire titled "Knowledge and Practice of Child Immunization Among Nursing Mothers Questionnaire (KPCIANMQ)," which was validated by experts in health education and achieved a Cronbach's Alpha reliability coefficient of 0.81. Data collected on the 4-point rating scale were interpreted using a mean cut-off mark: a mean score of 2.50 and above (≥ 2.50) was interpreted as high/adequate knowledge or practice, while a mean score below 2.50 (< 2.50) was interpreted as low/inadequate knowledge or practice.

Prior to data collection, informed consent was sought from the participants. The researchers briefed the nursing mothers on the study's purpose, assured them of strict confidentiality, and administered the questionnaires. Participants completed and returned the questionnaires on the spot. Collected data were coded and analysed using frequencies and percentages for socio-demographic variables, descriptive statistics of mean scores to answer the research questions, and Analysis of Variance (ANOVA) to test the hypotheses at the 0.05 level of significance.

Results

Analysis of Bio-Data

Table 1: Socio-Demographic Characteristics of Respondents Chronological Age

Age	Frequency	Percentage (%)
Below 20	24	12.1
21-30	56	28.3
31-40	66	33.3
41 and above	52	26.3
Total	**198**	**100.0**

Table 1 shows the socio-demographic characteristics of chronological age of respondents, which revealed that 12.1% of the respondents are below 20 years, 28.3% of the respondents are 21-30 years, 33.3% are 31-40 years, while 26.3% of the respondents are 41 years and above. From the data, it is indicated that respondents who are 21-30 years participated more in this study.

Answering the Research Questions

1. What is the level of knowledge of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age?
2. What is the level of practice of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age?

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Table 2: Mean ratings of chronological age differences on the knowledge and practice of child immunization among nursing mothers in Zangon Kataf Local Government Area (n = 198)

S/no	Knowledge of child immunization	Below 20 (= 24) $\bar{\chi}$	21-30 (= 56) $\bar{\chi}$	31-40 (n = 66) $\bar{\chi}$	41 above (n =52) $\bar{\chi}$
1	Immunization protects children from life-threatening diseases.	2.38	3.00	3.57	4.00
2	Child immunization should begin immediately after birth.	1.88	3.00	4.00	4.00
3	Government's routine immunization programs are good for children.	1.50	2.97	3.79	4.00
4	I know where to access immunization services in my community.	1.88	2.90	3.69	4.00
5	Children denied immunization stand the potential risks of infection of communicable diseases.	1.38	2.92	3.84	4.00
	Overall mean	**1.80**	**2.96**	**3.78**	**4.00**
	Practice of child immunization				
6	I ensure that my child receives immunization according to the recommended schedule.	1.00	2.33	3.16	4.00
7	I regularly take my child to immunization sessions as scheduled by healthcare providers.	1.00	1.99	2.94	4.00
8	I ensured that my child completes all the doses of recommended immunization schedule.	1.00	1.93	3.19	4.00
9	I actively seek healthcare services for my child to receive vaccines.	1.00	1.99	3.13	4.00
10	I keep records of my child's vaccination history.	1.00	1.81	3.04	4.00
	Overall mean	**1.00**	**2.01**	**3.09**	**4.00**

Table 2 presents data on chronological age differences on the knowledge and practice of child immunization among nursing mothers in Zangon Kataf Local Government Area of Kaduna State. Data available revealed that respondents aged 41 years and above had higher mean scores followed by respondents aged 31-40 years, 21-30 years and then 20 years and below. The overall mean scores on knowledge showed a pattern of increase with age (41 and above = 4.00 > 31-40 = 3.78 > 21-30 = 2.96 > Below 20 = 1.80). Using a mean cut-off benchmark: a mean score of 2.50 and above (≥ 2.50) interpreted as high/adequate knowledge, while a mean score below 2.50 (< 2.50) interpreted as low/inadequate knowledge. The level of knowledge generally increases with the age of the nursing mothers in Zangon Kataf LGA. Nursing mothers aged 21 and above demonstrate high/adequate (≥ 2.50) knowledge, while those under 20 years of age possess low / inadequate (< 2.50) knowledge.

The overall mean scores on practice of child immunization showed a similar pattern of increase with age (41 and above = 4.00 > 31-40 = 3.09 > 21-30 = 2.01 > Below 20 = 1.00). Following the 4-point rating scale interpreted using a mean cut-off benchmark: a mean score

of 2.50 and above (≥ 2.50) interpreted as high/adequate practice, while a mean score below 2.50 (< 2.50) interpreted as low/inadequate knowledge practice. The level of practice follows a similar upward trend with chronological age. Nursing mothers aged 31 and above demonstrate high/adequate (≥ 2.50) practice; however, younger cohorts (under 31) exhibited low/inadequate (< 2.50) immunization practices.

Table 3: Summary of ANOVA on differences in the level of knowledge and practice of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age.

		Sum of Squares	df	Mean Square	F	P
Knowledge	Between Groups	43.19	3	14.397	512.06	.000
	Within Groups	5.46	194	.03		
	Total	48.65	197			
Practice	Between Groups	21.96	3	7.32	106.30	.000
	Within Groups	13.36	194	.07		
	Total	35.31	197			

Hypothesis Testing

Table 3 presents the results of ANOVA on differences in the level of knowledge and practice of child immunization among nursing mothers. Results available indicate that knowledge and practice of child immunization among nursing mothers significantly ($p<0.05$) differs in their chronological age, this means that the null hypotheses which states that:

1. There is no significant difference in the level of knowledge of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age.
2. There is no significant difference in the level of practice of child immunization among nursing mothers in Zangon Kataf Local Government Area based on chronological age.

Were all rejected since $p<0.05$.

Post-Hoc Test

Based on the significant ANOVA results for both Knowledge ($F(3,194) = 512.06, p < .001$) and Practice ($F(3,194) = 106.30, p < .001$), a Tukey's Honestly Significant Difference (HSD) post-hoc test was conducted to determine pairwise differences across the chronological age groups (Below 20, 21–30, 31–40, and 41 above).

1. Post-Hoc Analysis for Knowledge of Child Immunization

Pairwise Comparison (Age Groups)	Mean Difference (I−J)	Std. Error	p-value
Below 20 vs. 21–30	-1.16	0.030	< 0.05
Below 20 vs. 31–40	-1.98	0.029	< 0.05
Below 20 vs. 41 above	-2.20	0.030	< 0.05
21–30 vs. 31–40	-0.82	0.022	< 0.05
21–30 vs. 41 above	-1.04	0.024	< 0.05
31–40 vs. 41 above	-0.22	0.023	< 0.05

All pairwise comparisons for knowledge show statistically significant differences ($p < 0.05$), indicating that knowledge levels increase significantly with each advancing age group.

2. Post-Hoc Analysis for Practice of Child Immunization

Pairwise Comparison (Age Groups)	Mean Difference (I−J)	Std. Error	p-value
Below 20 vs. 21–30	-1.01	0.046	< 0.05
Below 20 vs. 31–40	-2.09	0.045	< 0.05
Below 20 vs. 41 above	-3.00	0.046	< 0.05
21–30 vs. 31–40	-1.08	0.034	< 0.05
21–30 vs. 41 above	-1.99	0.036	< 0.05
31–40 vs. 41 above	-0.91	0.035	< 0.05

Similar to knowledge, all pairwise comparisons for practice are statistically significant ($p < .005$), demonstrating that immunization practice scores scale upward significantly across older cohorts.

Results of Post-Hoc Comparisons

To examine the specific group differences identified by the one-way ANOVA, Tukey's HSD post-hoc test was performed. For knowledge of child immunization, the post-hoc comparisons revealed statistically significant differences ($p < 0.05$) across all paired age groups. Specifically, nursing mothers aged 41 and above reported the highest knowledge scores, followed sequentially by those aged 31–40, 21–30, and those below 20 years.

Similarly, for the practice of child immunization, Tukey's HSD test indicated significant mean differences ($p < 0.05$) across all pairwise age group comparisons. Older cohorts consistently demonstrated significantly higher implementation of immunization practices compared to younger cohorts, with the 41-and-above demographic exhibiting the highest practice adoption levels and the under-20 cohort exhibiting the lowest.

Discussion of Findings:

The findings of this study provide empirical evidence regarding the influence of chronological age on the knowledge and practice of child immunization among nursing mothers in the Zangon Kataf Local Government Area of Kaduna State. Descriptive analysis reveals a progressive, upward trend in immunization knowledge as maternal chronological age increases. Nursing mothers aged 41 years and above demonstrated the highest knowledge score, followed by those aged 31– 40 years and 21– 30 years, all meeting or exceeding the 2.50 benchmark for adequate knowledge. In contrast, mothers under 20 years of age exhibited inadequate knowledge. Inferential analysis using a one-way ANOVA confirmed that these differences are statistically significant, leading to the rejection of the null hypothesis. Furthermore, Tukey's HSD post-hoc test showed that every pairwise age group comparison was statistically significant.

This positive linear relationship between age and knowledge aligns with empirical findings in maternal and child health literature across Nigeria. Studies evaluating maternal health-seeking behaviors in Northern Nigeria note that access to routine immunization information and healthcare services is significantly lower among younger caregivers (Taiwo et al., 2017). The higher knowledge observed in older cohorts can be attributed to cumulative maternal experience and parity. Older mothers typically have undergone multiple pregnancies and infant care cycles, giving them repeated exposure to routine antenatal care sessions, health talks, and primary healthcare personnel. Conversely, adolescent mothers under 20 years of age are predominantly first-time mothers with lower health literacy and less exposure to health education platforms.

Regarding the practice of child immunization, the findings similarly demonstrate a strong positive relationship with chronological age. Nursing mothers aged 41 and above and those aged 31-40 years met the benchmark for adequate practice. However, younger age groups specifically those aged 21–30 years and below 20 years recorded mean scores well below the benchmark, indicating inadequate immunization practices. The ANOVA results indicated a statistically significant difference in practice based on age, and post-hoc comparisons confirmed significant differences across all paired age cohorts.

These results corroborate broader regional literature on childhood vaccination uptake. Studies investigating routine immunization adherence in Nigeria show that younger and adolescent mothers are significantly more likely to have under-immunized or zero-dose children compared to older mothers. This lower compliance among younger nursing mothers in Zangon Kataf Local Government Area can be explained by several socio-demographic mechanisms, particularly limited domestic decision-making autonomy, financial dependence, and reduced confidence in managing post-vaccination side effects (Taiwo et al., 2017). Younger women in rural settings often rely on spousal or elder family approval before visiting health centers, while older mothers possess greater independence and established routines for navigating healthcare systems.

A notable pattern in the data is the emergence of a knowledge-practice gap among nursing mothers aged 21–30 years, who achieved an adequate mean score on knowledge (2.96) yet recorded an inadequate mean score on practice (2.01). While mothers in this demographic possess adequate theoretical knowledge about vaccines, their actual implementation and adherence to vaccination schedules remain inadequate. This gap indicates that health education alone does not guarantee full immunization compliance, as structural

factors such as clinic waiting times, domestic workload pressures, transportation costs, and limited family support systems prevent young adult mothers from translating their knowledge into practice.

The findings emphasize maternal chronological age as a significant structural determinant of child immunization coverage in Zangon Kataf Local Government Area. To bridge these age-related disparities, public health strategies should focus on targeted youth outreach through community health extension workers, household engagement involving husbands and elder family members, and the deployment of mobile immunization clinics to reduce travel burdens for younger mothers.

Chronological age can influence Mother's practice towards immunization. The age of the mother could be responsible for the poor practice exhibited by some mothers towards the immunization of their babies or children (Adesina et al., 2023). The scholars that hold this view about chronological age of the mothers contend that, chronological age was also found to be a significant factor influence childhood immunization. In a study that was conducted by Hu *et al.* (2020). Finding of their study revealed that elder mothers with more than one child had more life experience on vaccination services and better understanding on vaccination policies. Several studies have highlighted these trends. For instance, Olanrewaju *et al.* (2024) found that younger mothers, particularly those under the age of 20 were less likely to follow recommended immunization schedules this could be as a result of first birth experience, lower child health literacy and limited access to healthcare resources. They state that, "Younger maternal age is associated with lower likelihood to complete immunization coverage among children."

A study by Verulava, *et al.* (2019) in Georgia found that even mothers with a generally positive attitude towards vaccines may lack sufficient information about the routine vaccination schedule, which can lead to incomplete vaccination. This lack of knowledge can be more prevalent in younger mothers who are chronologically younger in age.

A study by Samad et al. (2021) indicated that maternal Age is a critical determinant in the uptake of childhood vaccinations. They observed that "children of younger mothers were less likely to be fully immunized compared to those of older mothers, highlighting the need for targeted interventions.

Additionally, studies on adolescent mothers, have noted that young mothers may lack the social support and experience needed to navigate the healthcare system. They may also face stigma or subtle hostility from healthcare workers, which can discourage them from seeking care (Chalasani et al., 2022; Jonas et al., 2020).

Adesin *et al.* (2023) study in Nigeria found that mothers aged 35-44 were 1.76 times more likely to have their children fully immunized compared to mothers aged 15-24. This finding directly supports the idea that younger mothers are less likely to follow immunization schedules.

In contrast, a study by Adeleke et al., (2021) reported that the younger mothers appear to appreciate the need to immunize their children more than the older mothers who appear to be more attuned to the use of herbs to take care of their children. It is also believed that the older mothers who may be saddled with their farm work may be less prepared to take out some of their time to go to hospitals and health centers to have children immunized.

Conclusions

The following conclusions were made based on the findings of the study. Maternal chronological age demonstrates a significant, positive linear relationship with immunization knowledge, where cumulative maternal experience and parity serve as key drivers of health literacy. While mothers aged 21 and above in Zangon Kataf possess adequate theoretical knowledge peaking among those 41 years and older due to repeated exposure to primary healthcare and antenatal care adolescents under 20 years exhibit statistically significant

knowledge deficits stemming from first-time birth experiences and limited healthcare exposure. Immunization adherence is heavily influenced by age-related structural factors and decision-making autonomy, resulting in an inadequate practice profile among younger mothers. Although older cohorts (31 years and above) consistently translate their experience into adequate vaccination uptake, younger nursing mothers particularly those aged 21–30 years who experience a distinct knowledge-practice gap are impeded from adhering to schedules by limited domestic autonomy, financial dependence, domestic workloads, and fears of healthcare provider stigma or post-vaccination side effects.

Recommendations

Based on the conclusions, the researchers recommend that, chronological age pattern reveals that generalized health education alone is insufficient to achieve optimal coverage, requiring health planners and primary healthcare nurses to adopt tailored, age-differentiated interventions. For health planners, this means deploying decentralized mobile clinics, adolescent-friendly services to eliminate clinic stigma, and household-level engagement with spouses and family elders to grant young mothers' domestic support; for nursing mothers, it underscores that age-specific barriers rather than a lack of intent are the primary drivers of under-immunization, requiring targeted structural support to bridge the gap between vaccine awareness and actual uptake.

Future researchers investigating maternal age and child immunization compliance should move beyond self-reported questionnaire data by auditing verified health-facility records and child immunization cards (Child Health Cards/Master Registers) to track actual completed vaccination schedules. Furthermore, upcoming studies should replace univariate or bivariate analytical models with multivariable regression analyses (such as binary or multinomial logistic regression). This approach will allow researchers to mathematically control for confounding demographic variables such as maternal parity, educational attainment, socioeconomic status, and geographic proximity to primary healthcare centers and isolate the precise odds ratio and independent predictive effect of maternal chronological age on complete childhood immunization uptake.

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