ASSESSMENT OF CAREGIVERS' KNOWLEDGE, RETENTION AND UTILIZATION OF CHILD HEALTH CARDS IN OYO STATE, NIGERIA: A MIXED METHOD STUDY WITH A CONVERGENT DESIGN

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Submission Date: 27th Mar, 2024
Date of Acceptance: 23rd Dec., 2024
Publication Date: 31st Mar., 2025

ABSTRACT

Background: **The 'Child health card' (CHC) is integral to monitoring a child's growth and assessing development to support the early detection of malnutrition and prompt intervention. CHC is also valuable in keeping track of a child's vaccinations. There are limited studies on knowledge and utilization of CHC in Oyo state, Nigeria. We therefore aimed to assess caregiver's knowledge, retention, and utilization of child health cards in Ibadan, Oyo State, Nigeria.**

Method: **A community-based mixed-method study using a parallel convergent design was employed. Quantitative data were collected from 617 caregivers at their compounds in the selected communities using an interviewer-administered questionnaire. Qualitative data were collected by interviewing caregivers and healthcare workers at health facilities. Bivariate analysis of quantitative indicators and thematic analysis of qualitative interviews were conducted.**

Result: **Caregiver knowledge of the CHC, including the contents of the CHC and growth charts, was poor, but retention was relatively high (69.6%). Retention of the CHC was higher among caregivers whose index child was <12 months (p=0.011) and among those with good knowledge of the CHC (p<0.001). Being employed (p=0.016), having tertiary education (p=0.027), having good knowledge (p<0.001), and good perception of the CHC (p=0.001) were positively associated with the utilization of CHC. We found that when caregivers failed to present the card at immunization clinics, they often faced verbal reprimands from healthcare workers, and in some cases, their child's vaccination was denied.**

Conclusion: **CHC retention was high despite low utilization by caregivers. Therefore, interventions designed to improve community awareness of the CHC could provide an opportunity to improve the use of child health cards in this setting.**

Keywords: Vaccine card, Home-based record, Under-five children, Card holding, Growth monitoring

BACKGROUND

The growth and physical development of children are important indicators of community health.[1,2] Therefore, high-quality child health services are needed for children to reach their full potential, especially in their early years when they are most vulnerable to infectious diseases, nutritional deficiencies and other environmental influences.[3,4] As a result, child growth monitoring has been embedded in primary healthcare in most countries to provide regular developmental assessment to detect children in need of early intervention.[5]

Studies from low- and middle-income countries (LMICs) suggest healthcare providers and caregivers have inadequate knowledge about early childhood development and the need for growth monitoring instruments.[6,7] Without regular monitoring, some children may miss out on referrals to specialized health services and developmental support that could help them fulfil their potential.[3] To promote early, appropriate, and regular monitoring of growth and development in children, child health cards (CHC) or child welfare cards (CWC)—a home-based record usually maintained in the household by caregivers and brought to the health facilities at each visit to be completed by health workers, have been introduced.[8,9] CHCs are affordable, easily stored, and retrievable.

They contain a child's vital health information, such as birth data, pattern of growth in weight, immunization, including adverse events, vaccination appointment visits, and episodes of illness of the child.[10] CHCs also include vital information required for safe childhood, such as preparation of oral rehydration solution, and administration of zinc tablets. The card serves as a guide for healthcare providers in making objective clinical decision as well as reference material for child survival strategies for caregivers.[8,9]

Despite the integration of CHCs in healthcare, a gap still exists in the knowledge, retention, and utilization of child health cards among caregivers, especially in LMICs.[9] Kaphle *et al.*, in their cross-sectional study among women in the Kaski district of Nepal, found that only 25.2% of the mothers were adequately aware of different aspects of the CHC.[11] Similarly, 38.2% of caregivers in Amritsar district, India, had adequate awareness of growth charting.[12] A study in South-West Nigeria also found that only 21.8% of the caregivers had good knowledge of the intervention contents of the CHCs, which was associated with the underutilization of the card.[9] Low retention of CHCs has been reported in sub-Saharan Africa, ranging from 20.7% in the Democratic Republic of the Congo to 69.2% in South Africa.[13] In South-West Nigeria retention is 49.1% and 40.7% among caregivers of children aged 12-23 months and 24-35 months old, respectively.[14]

Sub-optimal knowledge, retention and utilization have been linked to a range of health system and caregiver factors. Caregivers with a poor understanding of the CHC and do not appreciate its role as a long-term vaccination record, alongside inadequate counselling of caregivers on the use and safekeeping of CHCs by health workers, have been associated with low utilization. Poor paper quality of the cards themselves, resulting in damage, also hinders retention.[11,15] Studies have identified delivery place, mother experiencing complications during pregnancy and utilization of health facilities as important factors affecting the utilization and retention of child health cards.[16,17]

Caregiver's retention of child health card has been linked to vaccine uptake.[13] In Oyo state, CHC retention is 57.4% for children aged 12-23 months and 51.9% for children aged 24-35 months, according to the 2021 Multiple Indicator Cluster Survey,[18] but data on knowledge and utilization of the CHC in the state are limited. Assessing retention, knowledge and utilization of CHC among caregivers of children under-five is therefore important, given the sub-optimal uptake of childhood immunization in Oyo state.[18] We therefore sought to assess caregivers' knowledge, retention, and utilization of CHCs in Lagelu Local Government Area (LGA), Ibadan, Oyo State. This evidence should support the government, policy makers and other stakeholders in the Ministry of Health with improved data for policies related to child health card utilization.

METHODS

We conducted a mixed-method study using a parallel convergent design (QUAN + qual) between October 2019 to February 2020. The quantitative study was a community-based cross-sectional study, while the qualitative study was exploratory, involving semi-structured interviews with caregivers and healthcare workers. Data was analysed and presented separately, and interpretation was combined in the discussion.

Study settings

The study was conducted in Lagelu LGA, Ibadan, Oyo state. Ibadan is the second most populous city in southwest Nigeria, with an estimated population of over 3.5 million people, and it comprises 11 LGAs (5 urban and 6 peri-urban).[19] The main economic activities in Ibadan include agriculture, trade and public service. Lagelu LGA is one of the six peri-urban LGAs in Ibadan, with an estimated population of 211,700 in 2022.[20] It has 14 political wards, 22 primary health centres, and 3 public secondary-level facilities.[21]

Quantitative data

Sample size determination

The minimum study sample of 422 was based on the primary study question to compare vaccine card retention between urban and rural settings using the formula for comparing two proportions, where p_1=0.43 (urban) and p_2=0.23 (rural), with 80% power and at 95% confidence intervals.[22] We did not conduct a post-hoc power calculation for this pre-planned secondary analysis.

Sampling strategy

Multi-stage sampling was employed in the selection of study participants. Lagelu LGA was randomly selected from the six peri-urban LGAs in Ibadan in the first stage. Stratified random sampling was used in the second stage to select two rural and two urban wards in the LGA. From a list of communities in Lagelu LGA obtained from the state government secretariat, two communities were randomly selected from the wards in the third stage. Neighbouring communities were included in the study to reach the needed sample size. Nineteen communities were finally included in the study. All compounds in selected communities were approached for participation. The unit of enquiry was mothers of children under-five residing in the selected communities. In each eligible household, one mother was selected. If the household

had more than one eligible woman, the one with the youngest child was selected to ensure consistency in the sampling process and align with the study's focus on the recent utilization of child health cards. While we recognize that this approach may introduce a slight bias, as mothers of younger children are more likely to retain their cards, it was chosen to prioritize the most current data on child health card retention and utilization, which was central to our study objective.

Data collection procedures

Data was collected using an interviewer-administered questionnaire, which was piloted in Ibadan North LGA, Ibadan. Three trained data collectors, with at least secondary level education conducted the in-person interview (using the piloted questionnaire) and visually checked the CHC presented by respondents to verify information on the socio-demographic characteristics of the respondents, retention and utilization of the CHC, knowledge of the CHC and growth chart. Sociodemographic information assessed were woman and child age, religion, marital status, household wealth, employment status, education and place of residence (rural or urban). Household wealth was defined using the wealth Index, which was analyzed and categorized into tertiles: "poor," "middle," and "rich." The Wealth Index was determined using the Equity Tool, a country-specific measure based on the possession of specific household items, housing characteristics, and access to services, as utilized in the Nigerian Demographic and Health Survey (NDHS). Data was collected on Android tablets using Open Data Kit (ODK) software and underwent regular checks for accuracy.

Data analysis

We performed all quantitative data analyses using Stata 16.0. We described respondents' characteristics, retention, utilization, knowledge, and perception of the CHC and growth charts, and healthcare worker delivery of child health services using frequencies, percentages, means and standard deviations. The card was deemed retained if the caregiver was able to present it to our data collectors. Card utilization was measured through four self-reported variables: 1) taking the card to health facilities during immunization visits; 2) checking the card for home management of diarrhoea; 3) checking the card to know if the child is growing well; 4) checking the next appointment date for child's immunization. A score of one was given to each positive response, and we defined "good utilization" if the total score was ≥3 (≥75%). Knowledge of the card was measured across two domains: 1) knowledge of information contained in the card; 2) interpretation of growth charts. A score of one was assigned to each response in domain 1 and a score of two was assigned to each correct response in domain 2 based on presumed level of difficulty. Perception of CHC was also measured through 10 self-reported variables (Appendix 4). We used the chi-square test and independent t-test to assess factors associated with the retention and utilization of child health cards (a = 0.05).

Qualitative data

Convenience sampling was used to recruit caregivers and healthcare workers for qualitative semi-structured in-depth interviews. We included both caregivers and healthcare workers to provide an opportunity to compare and contrast findings from both groups. We selected healthcare workers for in-depth interviews based on a quota sampling approach to ensure a range of different cadres. Caregivers were conveniently sampled from immunization clinics after being briefed about the study. Participants were recruited from multiple clinics and communities to increase variability. This approach ensured the richness and depth of data. The venue and date of the interviews were discussed with the participants, including the healthcare workers. Interview took place at the health facilities and other agreed places in the community. Interviews were conducted in English and Yoruba languages by a trained data collector with experience in qualitative data collection, using the interview guide (Appendix 6 & 7). Each participant was given an incentive at the end of the interview. Incentives were detergent and disinfectants. We obtained written informed consent, and all interviews were audio recorded, transcribed and translated verbatim. Data-driven thematic analysis was used to identify codes and themes. The unit of analysis was child health card-related responses. Data was first coded independently by AAB and AK before being merged into themes and sub-themes.

Ethical consideration

Ethical approval was obtained from the Oyo State Ministry of Health (ref: AD/13/479/1433A) before the commencement of the study. Prior to participation, verbal consent was obtained from all participants, who were also given the opportunity to review the informed consent form. Participants were notified that their involvement was voluntary, and that the data collected would be used exclusively for research purposes.

RESULTS

Quantitative

Socio-demographic characteristics of respondents

We included 617 female caregivers, with a mean age of 29.5 years (SD±6.5). The majority of respondents (95.9%) were married or cohabiting with a partner, 52.9% practised Christianity, 51.5% resided in urban

Table 1: Socio-demographic characteristics of respondents (N = 617)

Characteristics	Total N= 617	Place of Residence	
		Urban N=318	Rural N=299
Age group of index child (months)			
0 – 11 months	179 (29.0)	98 (30.8)	81 (27.1)
12 – 23 months	149 (24.2)	73 (23.0)	76 (25.4)
≥ 24 months	289 (46.8)	147 (46.2))	142 (47.5)
Age group of mothers (years) [a]			
Less than 35 years	451 (76.2)	242 (79.9)	209 (72.3)
35 years and above	141 (23.8)	61 (20.1)	80 (27.7)
Age group of fathers (years)			
Less than 35 years	239 (44.3)	130 (45.6)	109 (42.9)
35 years and above	300 (55.7)	155 (54.4)	145 (57.1)
Religion [a]			
Christianity	325 (52.9)	172 (54.3)	153 (51.5)
Islam	289 (47.1)	145 (45.7)	144 (48.5)
Marital status			
Married/Living together	397 (95.9)	154 (97.5)	243 (94.9)
Divorced/Separated	6 (1.4)	3 (1.9)	3 (1.2)
Single	11 (2.7)	1 (0.6)	10 (3.9)
Household wealth			
Poor	7 (1.2)	0 (0.0)	7 (2.4)
Middle	72 (12.5)	15 (5.2)	57 (19.8)
Rich	498 (86.3)	274 (94.8)	224 (77.8)
Employment status			
Private/public employees	105 (17.0)	74 (23.3)	31 (10.4)
Self employed	457 (74.1)	206 (64.8)	251 (83.9)
Unemployed	55 (8.9)	38 (11.9)	17 (5.7)
Education [a]			
No formal education	19 (3.1)	8 (2.5)	11 (3.7)
Primary	56 (9.1)	11 (3.5)	45 (15.1)
Secondary	350 (56.9)	165 (51.9)	185 (62.3)
Tertiary	190 (30.9)	134 (42.1)	56 (18.9)
Husband's education [a]			
No formal education	10 (1.7)	3 (1.0)	7 (2.5)
Primary	28 (4.8)	5 (1.6)	23 (8.1)
Secondary	310 (52.7)	130 (42.8)	180 (63.4)
Tertiary	240 (40.8)	166 (54.6)	74 (26.1)

Mean age of respondents = 29.5 (SD = 6.5)

[a] *Some respondents did not provide responses*

communities, and 86.3% belonged to wealthy households. Nearly three-quarters of the respondents (74.1%) were self-employed and over half had secondary education (56.9%) - Table 1.

Retention and utilization of child health card

Most caregivers reported that their child has been issued CHC (93.3%), of whom 69.6% (401/576) presented the card to data collectors. The National card (82.2%) was the most presented card type. The major reason for CHC retention as reported by caregivers was for future reference or purposes (93.0%) i.e., in situations whereby their child needs the card for travels or to pursue educational opportunities, while card misplacement or loss (42.6%) was the most reported reason for non-retention.

For utilizations, 17.2% of caregivers issued with CHCs reported taking the CHC with them for clinical consultations, aside from immunization visits. Only 12.2% reported making reference to the card to check how to manage acute diarrhoea at home, and 19.6% made reference to the card to know if child is growing well. However, the majority (82.5%) reported checking the date of next immunization visit from the card (Table 2). Immunization (93.2%), clinic consultation during child's illness episode (29.8%), vitamin A supplementation (19.1%) and growth monitoring (15.6%) were the most utilized child health services reported by the caregivers (Appendix 1).

Knowledge of child health card and growth chart

The findings regarding caregivers' knowledge of the CHC and growth charts are presented in Table 3. Overall, 90.8% were aware of the CHC or

Table 2: Retention and utilization of child health card among caregivers of children under-five in Lagelu LGA (N = 617)

Characteristics	Frequency	Percentage (%)
Child has been issued CHC		
Yes	576	93.3
No	41	6.7
Caregiver presents the card to interviewer		
Yes	401	69.6
No	175	30.4
Card type		
National	327	82.2
Company	71	17.8
Reason for retention of the card [a] (N=401)		
For future reference or purpose	373	93.0
For immunization purpose	9	2.2
Other reasons	8	2.0
Reason for non-retention of the card [b] (N=175)		
Card got misplaced or lost	49	28.0
Card with partner or relatives	18	10.3
Non-retention due to relocation	25	14.3
Other reasons	23	12.6
CHC taken along during child clinic visit apart from immunization (N=576)		
Yes	99	17.2
No	477	82.8
Check how to manage acute diarrhoea at home from CHC (N=576)		
Yes	70	12.2
No	506	87.8
Refer to child's card to know if he/she is growing well (N=576)		
Yes	113	19.6
No	463	80.4
Check date of next immunization visit from child card (N=576)		
Yes	507	88.0
No	69	12.0
CHC utilization by caregivers (N=576)		
Good	57	9.9
Poor	519	90.1

Note:[a] About 11(2.8%) of the respondents did not respond to reasons for retention, [b] 61(34.8%) did not respond to reasons for non-retention of CHC.

immunization card. The most common information on the card as reported by caregivers were immunization schedule (73.4%), child vital information i.e., name, date of birth (56.1%), place of immunization (23.0%) and information on child's growth (17.3%). Less than 4.0% of the caregivers correctly interpreted any of the growth charts and the majority could not report actions to be taken for any of the growth charts (*Appendix 2*). Only 41.0% (253/617) of the caregivers reported being counselled on the CHC, of whom 77.9% (197/253) were counselled at PHCs and 82.2% (208/253) were counselled during immunization clinic The mean scores for caregivers' knowledge of information on child health card and interpretation of growth chart were 1.9 (SD=1.7) and 0.3 (SD=1.4) respectively. The overall mean knowledge score was 2.2 ± (2.5).

Delivery of child health services and completion of CHC and growth chart

Assessment of the card by data collectors found the most common components completed by healthcare workers were child information (98.0%), vaccination received (96.8%), date of next visitation (95.8%) and facility information (94.0%). In 44.4% of the cards, child's weight at every immunization visit were documented but only 14.0% had the weights marked and connected (Appendix 3).

Factors associated with retention and utilization of child health card.

Association between caregivers' characteristics and their retention and utilization of the CHC are presented in Table 4. Caregivers who retained and utilized their child health card demonstrated significantly better knowledge of child health card compared to those that neither

retain nor utilized the CHC (p<0.001 in each case). Retention of CHC was higher for children aged 0-11 months compared to those in older age groups (p=0.011). Women in rural settings were more likely to retain their child's card compared to their urban counterpart (p=0.009).

Respondents' employment status, level of education and perception of the card were associated with utilization of the card. Women who were self-employed or unemployed were more likely to have poor utilization of the card compared to those with formal employment in private or public setting (p=0.016). Women with tertiary education were more likely to have good utilization of the CHC (p=0.027) Women who utilized the CHC demonstrated significantly better perception of the CHC compared to those that did not utilize the CHC (p=0.001).

Qualitative data

For the qualitative interviews, the majority of mothers (9 of 15 participants) were recruited from rural areas, while most healthcare workers (8 of 10 participants) were recruited from urban settings. Notably, all participating healthcare workers were female (Appendix 5).

We identified two major themes following data-driven thematic analysis of the qualitative data: a paradox of perception and utilization, and overcoming suboptimal CHC retention and utilization.

A paradox of perception and utilization

This theme describes the finding of caregivers having a good perception of the CHC but limited utilization of the card.

Caregivers described the CHC as an essential vaccination document that should be kept properly. They noted that the card serves as a "ticket" or entry pass, without which the child will not receive vaccinations. However, healthcare workers had mixed opinions on caregivers' perception of the card. While some alluded that caregivers valued the card, a few mentioned that caregivers with higher education did not value the card.

Caregivers reported that failure to bring the card during immunization visit can attract verbal insults from healthcare workers, but this was not apparent in the healthcare workers' interviews. However, one healthcare provider pointed that loss of the vaccine card is associated with confusion among caregivers and is a reason why caregivers default from immunization clinic, for example:

"Some (caregivers) even said: after the first immunization, they lost the card, and they didn't want to come without the card and did not know where to go without the card and they did not know what to do and they decided to stay back at home." CHEW, Female 50years

Confirming the finding in quantitative data, caregivers' motivation to keep the card was based on the belief

Table 3: Respondents' knowledge of child health card and growth chart

Characteristics	Frequency (N=617)	Percentage (%)
Are you aware of child health card or immunization card?		
Yes	560	90.8
No	57	9.2
Knowledge of information on child health card [a]		
Immunization schedule	453	73.4
Information on child feeding practice	67	10.9
Information on child's growth	107	17.3
Information on expected development milestone	32	5.2
Home management of diarrhoea	53	8.6
Previous child illnesses	30	4.9
Child vital information	346	56.1
Place of immunization	103	16.7
None mentioned	142	23.0
Knowledge of interpretation of growth charts		
Correct Interpretation of growth chart 1	24	3.9
Correct Interpretation of growth chart 2	21	3.4
Correct Interpretation of growth chart 3	22	3.6
Correct Interpretation of growth chart 4	23	3.7
Knowledge scores	Mean	SD
Knowledge of information on child health card (maximum possible score = 8)	1.9	1.7
Knowledge of interpretation of growth charts (maximum possible score = 8)	0.3	1.4
Overall knowledge scores (maximum possible score = 16)	2.2	2.5

[a] *Respondents could provide multiple responses*

that the card will be useful for the child in the future, such as processing of admission into higher education institution or travel purposes. Interviews with healthcare workers revealed that their counselling had also focussed on the future benefits of the card.

"They should keep it very well because the baby may need it for school, higher institution and traveling, they can ask anytime. We normally tell the mothers to keep it very well." Nurse, Female, 58 years

Utilization of the card among caregivers was limited to vaccination services. Use of duplicate copy of the card, which is to be kept at the health facility, was very uncommon; rather the child will miss the immunization if the caregiver fails to bring the card to immunization clinic.

"They will embarrass the person and tell the person to come back whenever she has the card." Caregiver, female

Caregivers revealed that they may be given the opportunity to buy a new card in private hospitals. Caregivers however did not report disapproval of the action if the healthcare workers decided not to vaccinate their child when they failed to bring the card. The penalty associated with card misplacement was part of the reasons for limited use of the card for vaccination related purposes, as caregivers were conscious not to misplace the card. Caregivers also believed the card has no use besides immunization clinic, hence they do not take it for other clinic visits.

"I don't (take it for other clinics aside immunization) because it will not be useful at that moment, so why would I take it?" Caregiver, female 40 years

Table 4: Factors associated with retention and utilization of child health card

Characteristics	Retention [a]			Utilization		
	Yes	No	P-value	Good	Poor	P-value
Age group of index child (months)						
0 – 11 months	125 (31.2)	34 (19.4)		22 (37.9)	157 (28.1)	
12 – 23 months	95 (23.7)	43 (24.6)	**0.011**	10 (17.3)	139 (24.9)	0.215
≥ 24 months	181 (45.1)	98 (56.0)		26 (44.8)	263 (47.0)	
Age group of mothers (years)[a]						
Less than 35 years	301 (77.2)	122 (72.6)		45 (80.4)	406 (75.7)	
35 years and above	89 (22.8)	46 (27.4)	0.249	11 (19.6)	130 (24.3)	0.441
Child's position in the family						
First	130 (32.4)	57 (32.6)		24 (41.4)	172 (30.8)	
Second	185 (46.1)	78 (44.6)	0.915	23 (39.6)	260 (46.5)	0.255
Third	86 (21.5)	40 (22.8)		11 (18.9)	127 (22.7)	
Number of sibling category						
One or less	212 (52.9)	103 (58.9)		34 (58.6)	302 (54.0)	
More than one	189 (47.1)	72 (41.1)	0.184	24 (41.4)	257 (46.0)	0.504
Religion [a]						
Christianity	209 (52.1)	98 (56.0)		28 (48.3)	297 (53.4)	
Islam	192 (47.9)	77 (44.0)	0.391	30 (51.7)	259 (46.6)	0.455
Employment status						
Private/public employees	68 (17.0)	33 (18.9)		17 (29.3)	88 (15.7)	
Self employed	298 (74.3)	133 (76.0)	0.309	39 (67.2)	418 (74.8)	**0.016**
Unemployed	35 (8.7)	9 (5.1)		2 (3.5)	53 (9.5)	
Education [a]						
Primary or less	43 (10.8)	21 (12.1)		2 (3.5)	73 (13.1)	
Secondary	239 (59.7)	89 (51.1)	0.151	31 (53.4)	319 (57.3)	**0.027**
Tertiary	118 (29.5)	64 (36.8)		25 (43.1)	165 (29.6)	
Place of residence						
Rural	210 (52.4)	71 (40.6)		22 (37.9)	277 (49.5)	
Urban	191 (47.6)	104 (59.4)	**0.009**	36 (62.1)	282 (50.5)	0.092
	Mean (SD)	**Mean (SD)**		**Mean (SD)**	**Mean (SD)**	
Caregivers' knowledge of child health card**	2.6 (2.7)	1.7 (1.6)	**< 0.001**	4.7 (4.0)	2.0 (2.1)	**< 0.001**
Caregivers' perception of child health card**	4.1 (3.3)	3.9 (3.1)	0.428	5.4 (3.4)	3.7 (3.2)	**0.001**

[a] *Some respondents did not provide any response*

*** T-test*

Table 5: Codes and themes from the qualitative data analysis

Theme	Sub-themes	Code
A paradox of perception and utilization	An essential vaccination document	Evidence of child vaccination status
		Non-utilization of card duplicate in health facilities
	Entry pass to vaccination clinic	No card, no immunization
		Verbal abuse for not coming with the card
Overcoming suboptimal retention and utilization of child health card	Motivation for retention	For future reference
		A guidance for healthcare workers
	Barriers to card retention	Relocation
		Ignorance of card benefits
		Poor attitude to immunization
		Caregivers' carelessness
	Strategies to improve retention and utilization	Health education by health care workers
		Mass sensitization
		Support from spouse
		Making it a requirement for school entry

Overcoming suboptimal retention and utilization of child health card

This theme focuses on barriers to card retention and strategies to improve retention and utilization. Healthcare workers identified residential relocation and travel to another place for a long time as the major barriers to card retention, but this was not apparent in the caregiver's interviews. Rather, carelessness was the major reason reported by caregivers for card displacement.

"They are just careless, myself for instance, I always keep the card in my child's wardrobe, and when I am going after the 15 days, it is even once in a month, I will just pick it up. so, the person is not very conscious and that is why they misplace the card." Caregiver female, 40 years

Other reasons for card misplacement included ignorance about benefits of the card and immunization, and poor attitude of caregivers towards immunization.

"Some people don't know the value (of the card). They just collected it for "formality" sake and think it is just to be kept anywhere anyhow." Caregiver, female 25 years

Health education, mass sensitization, spousal support, and making it a requirement for school entry were identified as strategies to improve retention by healthcare workers and caregivers.

DISCUSSION

We aimed to assess caregiver's knowledge, retention, and utilization of child health cards. We found knowledge of the card to be sub-optimal, card utilization limited to vaccination services, and retention was mostly driven by ascribed future benefits of the card to the child. Relocation, caregivers' carelessness, and ignorance of the benefits of the card were the key reported barriers to retention of the CHC

Retention of CHC in our study was found to be higher(69.6%) than reported in previous studies in South-West Nigeria (20.7%)[9], Democratic Republic of Congo (20.7%)[13], Uganda (66%)[23] and South Africa (69.2)[13], likely due to the higher socioeconomic status of our study population. Similar to the study conducted by Pahari in Nepal[15], we found card retention to be higher among caregivers of children below 12 months of age. This could be due to frequent vaccine schedules during this period. Given that the period 0-59 months represents a critical stage of child development, it is important that the provision of other preventive services such as Vitamin A and Zinc supplementation and deworming are promoted and integrated into routine service beyond the first 2 years of life. Non-vaccination of the child if the caregiver fails to present the child vaccine card during the immunization visit points to sub-optimal utilization of the duplicate copies, which are meant to be kept at the facilities and with the local community mobilisers. The introduction of an electronic database of child vaccination records may be necessary to reduce the incidence of missed vaccination due to vaccine card misplacement or loss. Moreover, implementation research is needed to understand barriers to community and facility linkages on immunization uptake and how this can be improved.

Utilization of CHC was generally restricted to vaccination, highlighting the missed potential, and this seemed to be both a health systems and community challenge. This finding aligns with the study conducted by Tarwa and De Villiers among mothers in South Africa, which reported that many mothers hardly bring the CHC during their child consultations, as 72% of them believed it was unnecessary to bring it along.[24] Similar to the study conducted in Uganda, we found high utilization of CHC among caregivers with tertiary

education in our study [25] and this could be linked to better health literacy. To improve CHC utilization among caregivers, they need to have good knowledge of its usefulness aside from vaccine-related purposes. Achieving this requires improved utilization of CHC among healthcare workers during clinic visits by caregivers. Though we did not directly assess knowledge and utilization of the card by health workers, findings from our study suggest sub-optimal utilization for non-vaccination-related purposes among healthcare workers. More studies are, however, required to understand barriers to the effective utilization of CHC among healthcare workers.

Knowledge of CHC in our study reflected utilization patterns, with particular gaps in growth monitoring. The caregivers' poor knowledge of the contents of the CHC could be due to inadequate training of healthcare workers on CHC usage, poor communication with caregivers about the significance of the CHC, failure to demand the CHC cards at all clinic visits, and poor health literacy, resulting in a lack of understanding of the card content.[24,26] Further studies are, however, needed to assess healthcare workers' knowledge of the card. The correct interpretation of the growth charts was higher among caregivers with a higher level of education, which may suggest the effects of health literacy in understanding the card's contents. Health information in future cards may be written in local languages to aid caregivers' understanding of its content.

Although it was difficult to establish temporal sequence, the mean CHC knowledge score was higher among caregivers who retained the CHC compared to those who did not. Kaphle et al.[11] and Pahari et al.[15] reported similar observations in their studies in Nepal, where maternal level of awareness and knowledge of CHC were linked to retention of CHC. This shows the significance of educating caregivers on the importance of CHC in growth monitoring and the development of their children.

Our study has some limitations. Firstly, we did not assess the knowledge of healthcare workers about the card. We also did not observe interactions between caregivers and healthcare workers during visits to health facilities to assess the quality of implementation and counselling provided on child health cards. Nevertheless, our mixed-method approach provided an opportunity to triangulate findings and offset some of these limitations.

CONCLUSION

The findings from this study reveal gaps in the utilization of child health cards in Oyo State, Nigeria, particularly around non-vaccine-related programmes like growth monitoring and promotion practices for children under five. Health managers and policy stakeholders may use findings from our study to design interventions to improve growth monitoring practices, and vaccination services.

Acknowledgement

We appreciate the community mobilizers for their cooperation and supportive roles during the data collection. We also extend our gratitude to the respondents for their participation in the study.

Authors' contribution

AAB, AAS and CK developed concept for the manuscript. AAB, OCU, ORB and AGF contributed to the data collection, AAS, AAB, ORB, CK, OCU, AGF and KOA contributed to the data analysis and interpretation. AAS, AAB and KOA drafted the manuscripts with inputs from all the authors. All the authors read and approved the manuscript.

Declaration of competing interests

The authors have no potential conflicts of interests.

Funding

The authors received no financial support for the study.

Data availability

Data supporting the findings are available from the corresponding author on reasonable request.

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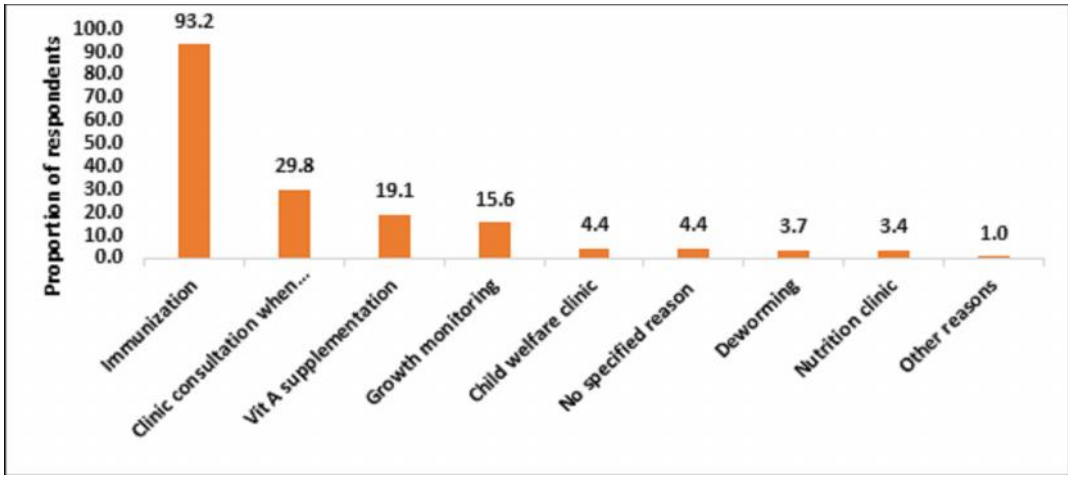
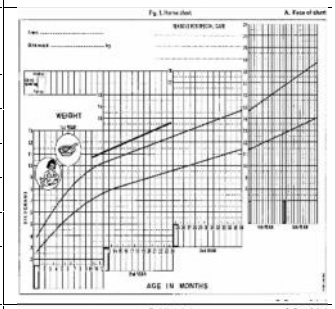
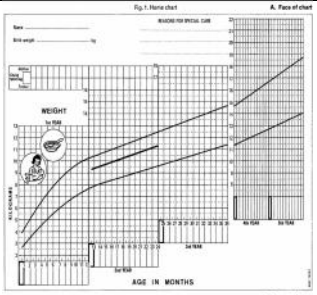
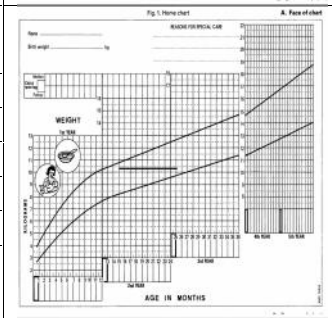
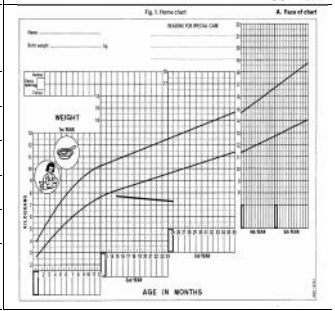
APPENDICES



Appendix 1: Child health services utilization by caregivers of children under-five in Lagelu Local Government Area

Appendix 2: Caregivers' responses on expected actions for different growth chart patterns

Characteristics	Frequency (N=617)	Percentage (%)	Growth charts
Responses on actions to be taken for growth chart 1			
Caregiver needs counsel	22	3.6	
Appreciate mother and continue care	7	1.1	
Find out reason for child's condition	8	1.3	
Child needs extra care	4	0.6	
Don't know/do nothing	576	93.4	
Responses on actions to be taken for growth chart 2			
Caregiver needs counsel	12	1.9	
Appreciate mother and continue care	15	2.4	
Find out reason for child's condition	9	1.5	
Child needs extra care	5	0.8	
Don't know/do nothing	576	93.4	
Responses on actions to be taken for growth chart 3			
Caregiver needs counsel	13	2.1	
Appreciate mother and continue care	5	0.8	
Find out reason for child's condition	18	2.9	
Child needs extra care	5	0.8	
Don't know/do nothing	576	93.4	
Responses on actions to be taken for growth chart 4			
Caregiver needs counsel	12	1.9	
Appreciate mother and continue care	6	1.0	
Find out reason for child's condition	9	1.5	
Child needs extra care	15	2.4	
Don't know/do nothing	575	93.2	

Appendix 3: Healthcare worker delivery of child health services to caregivers and child health card counselling for caregivers

Characteristics	Frequency	Percentage (%)
Healthcare worker delivery of child health services		
Components of the card completed by health care workers[a] (N=401)		
Child information	393	98.0
Facility information	377	94.0
Date of next vaccination	384	95.8
Vaccination received	388	96.8
Growth monitoring	178	44.4
Previous illness	18	4.5
Extra care questionnaire	35	8.7
Child weight documented on card at every immunization visit (N=401)		
Yes	178	44.4
No	223	55.6
Child weight marked and connected on the growth chart (N=401)		
Yes	56	14.0
No	345	86.0
Child health card counselling for caregivers		
Counselled on CHC (N=617)		
Yes	253	41.0
No	364	59.0
Facility where caregiver was counselled[a] (N=253)		
Traditional birth attendants	1	0.4
Faith clinic	10	4.0
Primary healthcare	197	77.9
Secondary healthcare	15	5.9
Tertiary healthcare	5	2.0
Others (Private facility)	16	6.3
Clinics where caregivers received counsel on CHC[a] (N=253)		
Ante-natal clinic	43	17.0
Post-natal clinic	35	13.8
Immunization clinic	208	82.2
Child welfare clinic	5	2.0

[a] *Respondents could provide multiple responses*

Appendix 4: Respondents' perception of child health card

Characteristics	Frequency (N=617)	Percentage (%)
It is only useful for child aged 0-12 month		
Agree	229	37.1
Neutral	118	19.1
Disagree	270	43.8
It should be brought to facility during immunization visit		
Agree	486	78.8
Undecided	89	14.4
Disagree	42	6.8
After immunization is completed, it does not have other usefulness again		
Agree	86	13.9
Undecided	118	19.1
Disagree	413	66.9
It should be kept at the facility and not with mother		
Agree	48	7.8
Undecided	101	16.4
Disagree	468	75.9
CHC is more useful to health workers than it is to caregivers		
Agree	62	10.0
Undecided	124	20.1
Disagree	431	69.9
Caregivers should come with it at every clinic consultation, not limited to immunization visit		
Agree	267	43.3
Undecided	131	21.2
Disagree	219	35.5
It should be use for growth monitoring after immunization is completed		
Agree	330	53.5
Undecided	166	26.9
Disagree	121	19.6
Children that are not sick do not require growth monitoring		
Agree	61	9.9
Undecided	179	29.0
Disagree	377	61.1
Health workers and NOT caregivers are expected to know interpretation of growth charts		
Agree	237	38.4
Neutral	186	30.2
Disagree	194	31.4
It has little role on child health and survival		
Agree	96	15.6
undecided	194	31.4
Disagree	327	53.0
Perception scores	Mean	SD
Perception of child health card	3.8	3.2

Appendix 5: Qualitative - socio-demographic characteristics of participants

Participants characteristics (Mothers)	
Settings	**Frequency**
Rural	9
Urban	6
Religion	
Islam	6
Christian	9
Education	
Primary	1
Secondary	11
Tertiary	3
Number of children	
One	2
Two	3
Three	8
More than three	2
Ethnicity	
Yoruba	15
Hausa	0
Igbo	0
Participants characteristics (healthcare workers)	
Settings	
Rural	2
Urban	8
Occupation	
Community health workers	3
Nurse	5
Health information officer	1
Doctor	1
Gender	
Female	10
Male	0
Ethnicity	
Yoruba	10
Hausa	0
Igbo	0
Education	
National diploma	6
Bachelor's degree	3
Postgraduate degree	1

Appendix 6: Interview guide for stakeholders' interview- -health care workers

Interview code	
Interview date	
Interviewer's name	
Ethnicity of the participant	
Sex of the participant	
Age of participant	
Marital status of participant	
Years of Practice	
Highest Level of Education	
Current Position	
Number of children (boys/girls) of the participant	
Language in which narrative interview was undertaken	
Informed Consent given by participant	
Consent given by participant to audio record the narrative interview	Yes/No
Participants' copy of informed consent form given	Yes/No

Focus: Assess respondent awareness, knowledge and previous utilization of card

1. What type of under-five health care services do you render at this health care facility?
2. How often do you conduct the following health services:
   I. Immunisation ii. Growth monitoring iii. Weight management
3. Are you aware of CHC/immunization card?
4. Tell me what you know about child health card.
   a. Its purpose or essence or function of the CHC
   b. Information it (CHC) contains.
5. Have you ever used it (CHC) before?
   a. What for? For whom?
   b. How frequently do you use the CHC?
   c. When was the last time?
   d. Do you sometimes use exercise book to substitute CHC?
   e. Have you received any training on child health card in your present job in the last one year? if yes please describe it

Focus: Caregivers perception

6. Tell me how important you think child health card is to survival of children in Nigeria.
7. What are your views about caregivers' perception of the card?
   a. What do you think is responsible for this?
   b. What do you think is responsible for mothers of infants not bringing their under five children CHC to the hospital?

Probe for

   i. Frequency of child presentation at the clinic for care services
   ii. Facilities factors (health workers, basic amenities, quality of care, satisfaction with service)
   iii. Factors relating to mothers (Knowledge of child health card, benefits of card and immunisation for children)
   c. What can be done to ensure caregivers have better perception of the card
      I. National and state levels
      II. Facility level
      III. Community level

Focus: Caregivers retention of child health card

8. What do you think is responsible for poor card holding among caregivers in Ibadan?
   a. What should be done to improve this?
   b. What do you do when mothers misplace their CHC?
   c. What is responsible for the misplacement of CHC by caregivers?
   d. Do you counsel mothers of under-five on CHC at this facility?
   e. Probe for content of counselling
   f. Has there been a change as a results of such actions?

g. What can be done to ensure caregivers have better perception of the card?
   I. National and state levels
   II. Facility level
   III. Community level

Focus: Caregivers utilization of child health card

9. In what ways can caregivers make use of child health card?
10. Tell me how caregivers make use of the card in this community. Is this satisfactory?
    a. What should be done to improve this?
       I. National and state levels
       II. Facility level
       III. Community level

Focus: Closing

Is there any other thing you like tell me? Probe for suggestions for improving use of child health card by?

Appendix 7: IDI interview guide for in-depth interviews with caregivers- (mothers)

Interview code	
Interview date	
Start Time	End Time:
Narrative Interviewer's name	
Ethnicity of the participant	
Sex of the participant	
Age of participants	
Marital status of participant	
Occupation	
Religion with participant code	
Participants Codes	
Highest Level of Education	
Number of children (boys/girls) of the participant	
Language in which narrative interview was undertaken	
Informed Consent given by participant	Yes/No
Consent given by participant to audio record the narrative interview	Yes/No
Participants' copy of informed consent form given	Yes/No

NB participants circular sitting arrangement diagram; Assign codes/ numbers to participants before start
Focus: assess respondent awareness and knowledge

Focus: assess respondent awareness and knowledge

1. Are you aware of CHC/immunization card?
2. Tell me what you know about the card
   a. Its purpose or essence
   b. Various sections
   c. Information you can obtain from it
   d. At what age is a child assigned a CHC?

I want to know reasons or circumstance you have needed to go to health facilities because of your child
Probe:

- o *Immunization*
- o *Medical treatment*
- o *Growth monitoring(Ways to ascertain if a child id growing well)*
- o *Nutrition clinic*
- o *Any other? –Views, Knowledge, attitude on CHC*

3. Does your child have one?
   a. When was he given?
   b. At what facility?
   c. Was it explained to you?

Focus: Assess caregivers' perception

4. What are your views about child health card?
   a. Usefulness *(probe: Growth monitoring, immunization, weight etc*)
   b. Importance
5. Do you consider the card as a tool for educating caregivers? Comment
   a. Probe why it is not a tool for educating caregivers
   b. Probe what can be done:
      i. For caregivers to appreciate it as educational tool; or
      ii. Enhance its use as educational tool for caregivers.

Focus: Caregivers retention of child health card

6. Did you take along the CHC during your last visit?
7. Kindly comment on why many caregivers don't keep the card well?
   a. Probe for challenges mother face in proper retention of card (religious view, client waiting time during clinic visits, carelessness, forgetfulness, rumours about the CHC)
   b. What should be done to improve the retention of the CHC?
      i. National and state levels
      ii. Facility level
      iii. Community level

Focus: Caregivers utilization of child health card

1. For each of the clinic visits, tell me your experience Probe:

- o Health workers ever asked for child's card.
- o What the health worker did with the card
- o Did they look at the card, document inside it?
- o Detect your child is not growing well.
- o If health worker used the card to counsel you

8. Were you satisfied with the service provided at the health care facility? If Yes Why, If No Why
9. In what ways do you make use of child health card?
   a. Check the documentation to know your child is growing well? Why?
   b. Bring it along when your child seeks medical care? Why?
   c. Check home management of diarrhoea from it? Why
10. What should be done to improve your utilization of child health card?
    i. National and state levels
    ii. Facility level
    iii. Community level

Focus: Closing

Is there any other thing you like tell me?