

# Effect of community-based social–behavioural intervention on determinants of maternal care-seeking for under-five children in Cross River State, Nigeria

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## Abstract

**Introduction:** Under-five morbidity and mortality remain high in sub-Saharan Africa, partly due to poor maternal care-seeking. Despite improved healthcare access, behavioural and social barriers still delay timely care for childhood illnesses. This study assessed the effect of a community-based behavioural intervention on determinants of maternal care-seeking in Cross River State, Nigeria.

**Methods:** A quasi-experimental design guided by the PRECEDE–PROCEED model was used. Sixty mothers were selected through a multi-stage sampling process and assigned to either an intervention or control group. The four-week intervention consisted of knowledge and skills training, as well as behaviour change communication, delivered via community information booths. Data were collected at baseline and week ten using a validated interviewer-administered questionnaire assessing predisposing, enabling, and reinforcing factors. Between-group differences were analysed using independent t-tests and Multivariate Analysis of Covariance (MANCOVA) ( $p < 0.05$ ), and Cohen's  $d$  estimated effect sizes.

**Results:** Although the sample size was small ( $N=60$ ), statistically significant improvements were observed. The MANCOVA indicated a strong multivariate effect (Pillai's Trace = .876,  $p < .001$ ), indicating that 87.6% of the variance in outcomes was attributable to group assignment. Univariate analyses showed significant improvements in knowledge ( $F = 68.21$ ,  $p < 0.001$ ,  $\eta^2 = 0.58$ ), attitude ( $F = 15.33$ ,  $p < 0.001$ ,  $\eta^2 = 0.24$ ), perception ( $F = 168.27$ ,  $p < 0.001$ ,  $\eta^2 = 0.77$ ), and reinforcing factors ( $F = 168.22$ ,  $p < 0.001$ ,  $\eta^2 = 0.77$ ). Enabling factors did not differ significantly between groups.

**Conclusion:** The intervention improved determinants of maternal healthcare-seeking for children under five.

**Keywords:** Maternal care-seeking, Under-five children, Community-based intervention, Predisposing, enabling, and reinforcing factors

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## Introduction

Although global efforts in maternal and child health have been sustained, preventable illnesses and death among children under five remain at levels that are deeply concerning across low- and middle-income countries (LMICs). In 2022, nearly five million children died from largely preventable conditions such as pneumonia, diarrhoea, and malaria (1). Sub-Saharan Africa continues to account for the greatest burden of these deaths, driven by persistent inequities in access to, and utilisation of, essential health

services. In this region, care-seeking behaviour is influenced by a dynamic interplay of individual, household, and structural factors that shape illness recognition, decision-making, and service use (2, 3).

Accelerating progress toward Sustainable Development Goal 3, therefore, requires interventions that address not only service availability but also the behavioural and social determinants that influence caregivers' health decisions. Evidence shows that even where functional health facilities exist, caregivers may delay or forgo seeking care due to

misconceptions, financial barriers, gender norms, and distrust of health systems (4, 5, 6). Understanding these determinants in specific local contexts is essential for designing interventions that promote timely and appropriate care-seeking for sick children.

Health behaviour theories provide useful frameworks for examining these determinants. The Andersen Behavioural Model conceptualises service utilisation as a function of predisposing, enabling, and need factors operating within social and structural contexts (7). The PRECEDE-PROCEED model complements this by emphasising ecological and participatory dimensions of behaviour change. In the PRECEDE-PROCEED framework, predisposing, enabling, and reinforcing elements are viewed as complementary factors that collectively influence an individual's willingness and ability to adopt positive health behaviours (8). Studies demonstrating the application of these models in diverse settings further underscore their utility in guiding community-level interventions (9).

Predisposing factors such as knowledge, attitudes, cultural beliefs, and perceived vulnerability strongly influence caregivers' ability to recognise illness symptoms and seek professional care (8, 10). In many LMICs, limited recognition of danger signs, spiritual interpretations of childhood illness, and low confidence in biomedical services contribute to delayed or inappropriate care-seeking (5, 6). Exposure to accurate health information, through mass media and positive interactions with health providers, has been shown to enhance caregivers' perceived susceptibility and willingness to seek timely care (11, 12).

Enabling factors, including proximity to health facilities, cost of services, transportation, and perceived quality of care, also play a critical role in shaping care-seeking behaviour (13). In Nigeria, structural barriers such as out-of-pocket payments, infrastructure limitations, and inconsistent service availability continue to constrain access (14). Local evidence from Cross River State highlights persistent barriers related to distance, road quality, and health worker availability, which collectively limit caregivers' ability to utilise available services (15, 16).

Reinforcing factors (family influence, peer support, and community leadership) shape the sustainability of care-seeking practices. Social norms and decision-making hierarchies, particularly in patriarchal communities, often affect women's autonomy in seeking care for their children (17). Strengthened social support networks, including the involvement of community leaders, have been shown to improve adherence to recommended maternal and child health behaviours (16, 17).

Nigeria's persistently high under-five mortality rate underscores the urgent need for interventions that address these behavioural and contextual determinants (18). Although initiatives such as the Integrated Management of Childhood Illnesses (IMCI) and Maternal, Newborn, and Child Health Weeks have expanded service availability, behavioural barriers continue to limit their effectiveness (19).

While numerous studies have explored determinants of care-seeking, few have examined these within structured community-based intervention frameworks, particularly in Cross River State (16).

This study evaluates the outcomes of a community-based social-behavioural intervention designed to strengthen determinants of maternal care-seeking for under-five children in Cross River State, Nigeria, by integrating behavioural theory with community engagement strategies.

## Methods

### *Study design*

A quasi-experimental design was employed to examine the outcomes of a community-based social-behavioural intervention on the determinants influencing maternal care-seeking practices among mothers of under-five children in Cross River State, Nigeria. The design drew on the PRECEDE-PROCEED planning model (7), emphasising participatory diagnosis and behavioural change at multiple ecological levels. Both experimental and control groups were observed at baseline and after a four-week intervention period, with outcome evaluation conducted at week ten. The design enabled comparative analysis of the predisposing, reinforcing, and enabling factors shaping maternal behaviours.

### *Study setting*

The research was conducted in Cross River State, located in the South-South geopolitical zone of Nigeria. The state covers approximately 20,156 km<sup>2</sup> and has a population of about 4.4 million (20). It comprises 18 Local Government Areas distributed across three senatorial districts: Southern, Central, and Northern. The area has a humid tropical climate and a largely agrarian economy, with notable health and educational infrastructure. Health facilities in the state include 593 primary, 139 secondary, and 2 tertiary (21).

### *Study population and eligibility*

The study targeted mothers aged 15-49 years who had at least one living child under the age of five years. Inclusion criteria: Women aged 15-49 years with a biological child under five; permanent residents of the selected communities; and those who consented to participate. Exclusion criteria: Mothers with no child under five; non-biological caregivers or transient residents; those unwilling to provide informed consent.

### *Sample size and sampling*

Sample size was determined using the sample size for proportions by Katz et al. (22).

$$N = \frac{(Z_{\alpha} + Z_{\beta})^2 \times P_0(1 - P_0)}{(P_1 - P_0)}$$

Where:

$Z_{\alpha}$  is the Z-score corresponding to the desired significance level

$Z_{\beta}$  is the Z-score corresponding to the desired power (1-beta).

$P_0$  is the prevalence.

$P_1$  is the desired level of the outcome.

Substituting:  $Z =$  the 95% confidence level of the standard normal distribution, ( $Z\alpha=1.96$ ), and  $Z\beta$  is the 80% power equivalent to 0.84, prevalence level at 50% which is also equal to 0.5, and keeping the desired level of the outcome at 80% (0.8),

$$n = \frac{(1.96+0.84)^2 * 0.5(10.5)}{(0.80.5)^2}$$

=

$$(2.8)^2 * 0.5(0.5)$$

$$0.3^2$$

$$N=21.77 \approx 22$$

The total number of participants after adding 10% attrition,  $22+2.2 = 24.24 \approx 24$

Assuming 95% confidence ( $Z\alpha = 1.96$ ), 80% power ( $Z\beta = 0.84$ ), and an estimated prevalence of 50% ( $P_0 = 0.5$ ) with an expected post-intervention improvement of 80% ( $P_1 = 0.8$ ), the minimum sample size was 22 per group. To account for potential attrition of 10%, the total sample size was increased to 24 participants per group. However, to strengthen analysis and mitigate attrition, the sample was increased to 30 participants per group (total  $n = 60$ ). No design effect was applied as simple random sampling was assumed, and power may be reduced if the true effect is smaller than expected.

The sample size was estimated for a comparison of proportions. However, the primary outcomes were continuous scores. A post-hoc power analysis using the observed effect sizes (e.g., Cohen's  $d > 2.0$  for key outcomes) indicates that the achieved sample of  $n=30$  per group provided ample power ( $>0.99$ ) to detect the large effects observed in this study.

A multi-stage sampling technique was employed to select mothers of children under five years old. Cross River State was divided into its three senatorial districts. The southern senatorial district was deliberately chosen as the intervention group, while the northern senatorial district served as the control group. The central senatorial district was excluded from the study to ensure geographical separation and act as a buffer zone to minimise contamination risk between groups. One LGA was randomly selected from the southern district using simple random sampling to form the intervention group, and a comparable LGA from the northern district was similarly chosen for the control group. Mothers meeting the inclusion criteria in these communities were enrolled through simple random sampling, with 30 eligible mothers selected from each group. Due to the community-based nature of the intervention, allocation concealment was not feasible. Baseline equivalence between the groups was assessed before evaluating outcomes.

#### *Study variables*

Dependent variable: Determinants of maternal care-seeking practices (predisposing, reinforcing, and enabling factors).

Independent variable: Community-based social-behavioural

engagement intervention. Intermediary variables: Predisposing, enabling, and reinforcing factors.

#### *Instrumentation*

A semi-structured, interviewer-administered questionnaire was designed in English. It included: Section A (socio-demographic characteristics), Section B (predisposing factors), Section C (reinforcing and enabling factors) (appendix III).

#### *Instrument validation and reliability*

The instrument underwent expert review for content and construct validity. A pilot test with 30 mothers from a similar setting confirmed reliability. The knowledge subscale (12 items; B1: Q14–Q25) scored a Cronbach's alpha of 0.909, with items scored as True = 1 and False = 0, where higher scores indicate better knowledge of care-seeking practices. The attitude subscale (4 items; B2: Q26–Q29) had an alpha of 0.907, scored on a 4-point Likert scale from Strongly Disagree (1) to Strongly Agree (4), with higher scores reflecting more positive attitudes toward care-seeking. The perceived domains subscales (B3: Q30–Q45), including perceived seriousness (4 items;  $\alpha = 0.905$ ), perceived benefits (4 items;  $\alpha = 0.906$ ), perceived barriers (4 items;  $\alpha = 0.908$ ), and perceived self-efficacy (4 items;  $\alpha = 0.906$ ), were also rated on a 4-point Likert scale, with higher scores representing greater seriousness, benefits, barriers, or confidence in seeking care, respectively. The reinforcing factors subscale (4 items; C1: Q46–Q49) had an alpha of 0.908, and the enabling factors subscale (4 items; C2: Q50–Q53) scored 0.912, both using the same 4-point Likert scale, with higher scores indicating stronger social support and better access to healthcare resources for childcare.

#### *Data collection procedure*

Data were collected in two phases: baseline and end-line. Preliminary advocacy visits and community entry meetings were held to obtain permission and consent. Four trained assistants administered the questionnaires in participants' homes under the supervision of the principal investigator. Ethical principles of autonomy, confidentiality, and non-maleficence guided all procedures.

#### *Intervention description*

The intervention, titled "Strengthening Maternal Care-Seeking Determinants," was developed based on the PRECEDE-PROCEED model and delivered over four weeks. It comprised two distinct components:

Mothers' Education and Counselling (MEC) Workshop: A three-day interactive workshop (four hours per day) was conducted at the local Primary Health Centre. The sessions were facilitated by the Principal Investigator and the Officer-in-Charge (OIC) of the health centre. The curriculum covered four core themes: (i) Common childhood illnesses and danger signs; (ii) Immunisation and preventive care; (iii) Maternal and child health services; and (iv) Addressing traditional

beliefs. Teaching methods included interactive presentations and role-playing scenarios. All participants completed the training.

**Community Information Booths:** Following the workshop, information booths were established at key community points and local churches for four consecutive Sundays. These were facilitated by trained faith-based and community leaders who distributed visual behaviour change communication (BCC) materials, including picture-based flipcharts on danger signs, brochures on immunisation schedules. These Sunday sessions were observed by the Principal Investigator and two Research Assistants.

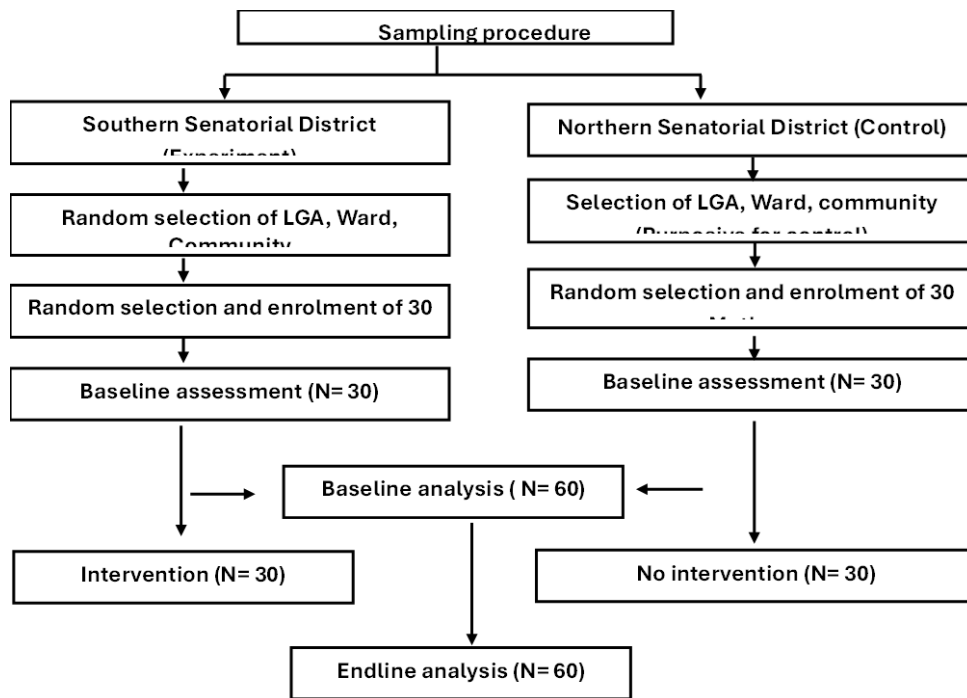
Intervention fidelity was assessed through structured monitoring. Attendance was recorded for all workshop and booth sessions. Facilitator adherence to the core curriculum was verified using a standardised checklist, ensuring each of the four key themes was covered. The quality of delivery at community booths was evaluated through direct observation by the research team.

*Control Group Condition*

Participants in the control group received standard care, which included routine health talks provided by Primary Health Centre staff. In addition, to control for attention bias, the research team provided a general educational session on maternal mental health and well-being. This ensured the control group received a similar amount of social interaction without exposure to the specific child health content. Intervention materials are included in [Appendix II](#).

*Outcome measurement and data analysis*

Outcome evaluation occurred in week 10. Changes in determinants of maternal care-seeking were analysed using IBM SPSS v23. Descriptive statistics summarised demographic data; inferential tests (Independent and paired t-tests) examined differences at a 5% significance level ( $p \leq 0.05$ ). Effect sizes (Cohen’s d) quantified the magnitude of change. Also, given baseline differences in ethnicity, age of child, perceived barriers, and self-efficacy, multivariate analysis of covariance (MANCOVA) was used to control for these confounders and baseline scores, thereby providing unbiased estimates of the intervention’s effect on end-line outcomes.



**Figure 1: Study Flow Diagram**

**Results**

A total of 60 consenting respondents participated in the study, with equal allocation to the control (N = 30) and experimental (N = 30) groups. Social demographics were

accessed for comparability. There were no statistically significant differences between the groups for most demographic characteristics. Ethnicity was the only variable with a statistically significant difference between the control and experiment groups,  $\chi^2(4) = 54.29, p = .001$  (Table 1).

Table 1: Socio-demographic characteristics of respondents (N=60)

Variables	Control, N = 30	Experimental, N = 30	$\chi^2$	P-value
	n (%)	n (%)		
<b>Marital status</b>				
Single	4(26.7%)	11(73.3%)	5.734	0.125
Married	23(56.1%)	18(43.9%)		
Divorced	1(100.0%)	0(0.0%)		
Separated	2(66.7%)	1(33.3%)		
<b>Occupation</b>				
Housewife	5(62.5%)	3(37.5%)	1.907	0.592
Unemployed	7(38.9%)	11(61.1%)		
Self employed	13(50.0%)	13(50.0%)		
Employed	5(62.5%)	3(37.5%)		
<b>Religion</b>				
Christian	27(47.4%)	30(52.6%)	4.317	0.116
Islam	2(100.0%)	0(0.0%)		
Traditional belief	1(100.0%)	0(0.0%)		
<b>Ethnicity</b>				
Effk	0(0.0%)	6(100.0%)	54.286	0.001*
Ejagam	0(0.0%)	7(100.0%)		
Bekwarra	25(100.0%)	0(0.0%)		
Ibibio	0(0.0%)	15(100.0%)		
Others	5(71.4%)	2(28.6%)		
Educational Level				
Primary	3(42.9%)	4(57.1%)		
Secondary	20(51.3%)	19(48.7%)		
Tertiary	6(50.0%)	6(50.0%)		
Non	1(50.0%)	1(50.0%)		
<b>Number in household</b>				
3	8(66.7%)	4(33.3%)	6.132	0.105
4	7(43.8%)	9(56.3%)		
5	10(66.7%)	5(33.3%)		
above 5	5(29.4%)	12(70.6%)		
<b>Number of children</b>				
1	8(57.1%)	6(42.9%)	3.877	0.423
2	12(50.0%)	12(50.0%)		
3	5(50.0%)	5(50.0%)		
4	4(66.7%)	2(33.3%)		
above 5	1(16.7%)	5(83.3%)		
<b>Number of children below five</b>				
1	22(56.4%)	17(43.6%)	3.891	0.143
2	8(42.1%)	11(57.9%)		
3	0(0.0%)	2(100.0%)		
<b>Sex of child</b>				
Female	11(44.0%)	14(56.0%)	0.617	0.432
Male	19(54.3%)	16(45.7%)		
<b>Loss of a child</b>				
Yes	4(40.0%)	6(60.0%)	0.480	0.488
No	26(52.0%)	24(48.0%)		

*N= frequency;  $\chi^2$ = Chi square statistics; P-value= Probability value*

The average age of mothers in the control group was 29.29 years (SD = 5.89), whereas in the experimental group it was 27.30 years (SD = 4.84). This difference was not statistically significant,  $t(58) = 1.42$ ,  $p = .163$ . However, the average age (in months) of the most recent child was significantly higher in the experimental group ( $M = 16.33$ ,  $SD = 12.3$ ) compared to the control group ( $M = 9.03$ ,  $SD = 5.59$ ),  $t(58) = 2.96$ ,  $p = .005$  (Table 2).

**Table 2: Independent t-test results for the age of mothers and the age of the most recent child**

Metric	Control (N = 30)		Experimental (N= 30)		p-value
	M (SE)	SD	M (SE)	SD	
Age of mother	29.29 (1.07)	5.89	27.30 (0.88)	4.84	.163
Age of the child	9.03 (1.02)	5.59	16.33 (2.25)	12.30	.005*

M = mean; SE = standard error; SD = standard deviation: Asterisk (\*) indicates statistical significance at  $p \leq .05$

*Baseline comparison of predisposing, reinforcing, and enabling variables between groups*

Independent samples t-tests were performed to compare baseline scores for moderating variables between the control and experimental groups. The results showed no statistically significant differences for most variables, indicating good baseline equivalence. Specifically, knowledge scores measured on a 12-point scale were similar across the two groups (M = 6.56, SD = 1.67 for control; M = 6.33, SD = 1.47 for experimental),  $p = .569$ . Attitude scores measured on a 16-point scale were also comparable (M = 6.96, SD = 1.82 for control, M = 7.00, SD = 1.83 for experiment),  $p = .944$ . There was a non-significant trend towards higher perceived seriousness in the experimental group (M = 7.00, SD = 1.72) compared to the control (M = 6.30, SD = 1.51),  $p = .100$ .

Similarly, a 16-point scale measurement of perceived benefits showed comparable means (control: M = 7.40, SD = 2.15; experimental: M = 7.00, SD = 1.68),  $p = .427$ . However, significant differences emerged for perceived barriers measured on a 16-point scale, with the experimental group reporting higher perceived barriers (M = 8.53, SD = 1.94) than the control group (M = 7.60, SD = 1.42),  $p = .038$ . Likewise, perceived self-efficacy, measured on a 16-point scale, was significantly lower in the experimental group (M = 11.56, SD = 1.16) than in the control group (M = 12.40, SD = 1.30),  $p = .011$ . No significant differences were observed for reinforcing factors ( $p = .285$ ) or enabling factors ( $p = .846$ ). Overall, the groups were largely comparable at baseline, apart from perceived barriers and self-efficacy, which showed statistically significant differences (Table 3).

**Table 3: Independent t-test result for baseline comparison for predisposing, reinforcing, and enabling variables between groups**

Metrics	Maximum Scale of measure	Control N = 30		Experiment, N = 30		P-value
		$\bar{X}(SE)$	$\pm SD$	$\bar{X}(SE)$	$\pm SD$	
Knowledge	12	6.56 (0.30)	1.67	6.33 (0.26)	1.47	0.569
Attitude	16	6.96 (0.33)	1.82	7.00 (0.33)	1.83	0.944
Perceived Seriousness	16	6.30 (0.27)	1.51	7.00 (0.31)	1.72	0.100
Perceived Benefit	16	7.40(0.39)	2.15	7.00(0.30)	1.68	0.427
Perceived Barrier	16	7.60 (0.26)	1.42	8.53 (0.35)	1.94	0.038*
Perceived Self-efficacy	16	12.40(0.23)	1.30	11.56(0.21)	1.16	0.011*
Reinforcing Factors	16	7.80(0.20)	1.09	7.46(0.21)	1.19	0.285
Enabling Factors	16	8.46(0.32)	1.75	8.36(0.39)	2.18	0.846

M = mean; SE = standard error; SD = standard deviation; CI = confidence interval. Effect size is reported as Cohen's d with 95% confidence intervals. Asterisk (\*) indicates statistical significance at  $p \leq 0.05$

*End-line comparison of predisposing, reinforcing, and enabling variables between groups*

The multivariate test showed a strong and statistically significant overall group effect on the combined predisposing, reinforcing, and enabling variables at end-line. Using Pillai's Trace, the group effect was .876, with an associated  $F(5,46) = 65.136$ ,  $p < .001$ , and a very large effect size (partial  $\eta^2 = .876$ ). This means that 87.6% of the variance in the combined behavioural outcomes was explained by whether a mother was in the experimental or control group, demonstrating a very powerful intervention effect.

Among covariates, the age of the child and baseline perception score contributed significantly to end-line outcomes. Age of child had Pillai's Trace = .213,  $F(5,46) = 2.491$ ,  $p = .044$ , while perception baseline had Pillai's Trace = .235,  $F(5,46) = 2.826$ ,  $p = .026$ . Ethnicity ( $p = .742$ ),

baseline knowledge ( $p = .896$ ), baseline attitude ( $p = .283$ ), baseline reinforcing ( $p = .468$ ), and baseline enabling ( $p = .052$ ) did not show significant multivariate influence.

Univariate results showed clear differences between groups for most outcomes. For knowledge, the group effect was  $F(1,50) = 68.207$ ,  $p < .001$ , with a large effect size (partial  $\eta^2 = .577$ ), indicating a meaningful improvement in knowledge among mothers in the experimental group. For attitude, the group effect was  $F(1,50) = 15.330$ ,  $p < .001$ , with partial  $\eta^2 = .235$ , showing that attitudes improved significantly among intervention participants. Perception demonstrated the biggest predisposing difference, with  $F(1,50) = 168.274$ ,  $p < .001$ , and a very large effect size (partial  $\eta^2 = .771$ ), indicating substantial perception change in favour of the experimental mothers.

Reinforcing factors showed similarly strong results. The group effect for reinforcing variables was  $F(1,50) = 168.222$ ,  $p < .001$ , with partial  $\eta^2 = .771$ , meaning the intervention improved sources of motivation and support for mothers in the experimental group.

Enabling factors, however, did not show a significant group difference. The group effect for enabling factors was  $F(1,50) = 0.955$ ,  $p = .333$ , with a very small effect size (partial  $\eta^2 = .019$ ). This indicates that enabling conditions, such as access

to services or environmental supports, remained similar across both groups at end-line.

Overall, the numerical evidence shows that the intervention significantly improved predisposing factors, knowledge, attitude, and perception, as well as reinforcing factors among targeted mothers, while enabling factors remained unchanged. These results confirm that the intervention was highly effective in shifting cognitive, motivational, and social determinants of health behaviour. (see Table 4a & b).

**Table 4a. Multivariate Effects (MANCOVA Analysis Pillai's Trace)**

Predictor	Pillai's Trace	F	Hypothesis df	Error df	Sig.	Partial $\eta^2$
Intercept	.599	13.714	5	46	.000	.599
Ethnicity	.056	.544	5	46	.742	.056
Age of Child	.213	2.491	5	46	.044	.213
Knowledge Score (Baseline)	.034	.324	5	46	.896	.034
Attitude Score (Baseline)	.123	1.295	5	46	.283	.123
Perception Score (Baseline)	.235	2.826	5	46	.026	.235
Reinforcing Factors (Baseline)	.092	.934	5	46	.468	.092
Enabling Factors (Baseline)	.206	2.393	5	46	.052	.206
Group	.876	65.136	5	46	.000	.876

**Table 4b. Univariate/post-hoc effects table (univariate/post-hoc effects table)**

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Knowledge score	125.974 <sup>a</sup>	8	15.747	14.139	.000	.693
	Attitude score	132.257 <sup>b</sup>	8	16.532	4.354	.000	.411
	Perception score	2947.403 <sup>c</sup>	8	368.425	30.241	.000	.829
	Reinforcing score	320.682 <sup>d</sup>	8	40.085	29.758	.000	.826
	Enabling-factors score	77.608 <sup>e</sup>	8	9.701	3.319	.004	.347
Intercept	Knowledge Score	11.599	1	11.599	10.414	.002	.172
	Attitude Score	28.343	1	28.343	7.465	.009	.130
	Perception score	305.515	1	305.515	25.078	.000	.334
	Reinforcing score	54.267	1	54.267	40.286	.000	.446
	Enabling-factors score	9.109	1	9.109	3.117	.084	.059
Ethnicity	Knowledge Score	.188	1	.188	.169	.683	.003
	Attitude Score	1.542	1	1.542	.406	.527	.008
	Perception Score	6.446	1	6.446	.529	.470	.010
	Reinforcing Score	1.787	1	1.787	1.327	.255	.026
	Enabling_factors score	.137	1	.137	.047	.829	.001
Age child	Knowledge Score	.587	1	.587	.527	.471	.010
	Attitude Score	2.434	1	2.434	.641	.427	.013
	Perception score	17.148	1	17.148	1.408	.241	.027
	Reinforcing score	5.557	1	5.557	4.125	.048	.076
	Enabling-factors score	19.164	1	19.164	6.557	.014	.116
Knowledge Score Baseline	Knowledge Score	1.151	1	1.151	1.033	.314	.020
	Attitude Score	.203	1	.203	.053	.818	.001
	Perception score	2.743	1	2.743	.225	.637	.004
	Reinforcing score	.069	1	.069	.052	.821	.001
	Enabling-factors score	.736	1	.736	.252	.618	.005

Attitude Score	Knowledge Score	2.026	1	2.026	1.819	.184	.035
Baseline	Attitude Score	12.201	1	12.201	3.213	.079	.060
	Perception score	8.699	1	8.699	.714	.402	.014
	Reinforcing score	.062	1	.062	.046	.831	.001
	Enabling-factors score	3.029	1	3.029	1.037	.314	.020
Perception score	Knowledge Score	.611	1	.611	.549	.462	.011
Baseline	Attitude Score	12.309	1	12.309	3.242	.078	.061
	Perception score	129.462	1	129.462	10.627	.002	.175
	Reinforcing score	1.820	1	1.820	1.351	.251	.026
	Enabling-factors score	.002	1	.002	.001	.977	.000
Reinforcing score	Knowledge Score	2.230	1	2.230	2.003	.163	.039
Baseline	Attitude Score	1.530	1	1.530	.403	.528	.008
	Perception score	9.770	1	9.770	.802	.375	.016
	Reinforcing score	.285	1	.285	.211	.648	.004
	Enabling-factors score	.126	1	.126	.043	.836	.001
Enabling-factors	Knowledge Score	6.910	1	6.910	6.204	.016	.110
score Baseline	Attitude Score	2.040	1	2.040	.537	.467	.011
	Perception score	2.676	1	2.676	.220	.641	.004
	Reinforcing score	4.552	1	4.552	3.379	.072	.063
	Enabling-factors score	20.794	1	20.794	7.115	.010	.125
group	Knowledge Score	75.965	1	75.965	68.207	.000	.577
	Attitude Score	58.207	1	58.207	15.330	.000	.235
	Perception score	2050.040	1	2050.040	168.274	.000	.771
	Reinforcing score	226.603	1	226.603	168.222	.000	.771
	Enabling-factors score	2.791	1	2.791	.955	.333	.019
Error	Knowledge Score	55.687	50	1.114			
	Attitude Score	189.845	50	3.797			
	Perception score	609.139	50	12.183			
	Reinforcing score	67.352	50	1.347			
	Enabling-factors score	146.121	50	2.922			
Total	Knowledge Score	5253.000	59				
	Attitude Score	7840.000	59				
	Perception score	109828.000	59				
	Reinforcing score	6757.000	59				
	Enabling-factors score	5075.000	59				
Corrected Total	Knowledge Score	181.661	58				
	Attitude Score	322.102	58				
	Perception score	3556.542	58				
	Reinforcing score	388.034	58				
	Enabling-factors score	223.729	58				

a. R Squared = .693 (Adjusted R Squared = .644); b. R Squared = .411 (Adjusted R Squared = .316)

c. R Squared = .829 (Adjusted R Squared = .801); d. R Squared = .826 (Adjusted R Squared = .799); e. R Squared = .347 (Adjusted R Squared = .242)

*Within-group comparison of predisposing, reinforcing, and enabling variables in the control group (baseline vs. endline)*  
 In the control group, paired sample *t*-test analyses revealed modest and mostly non-significant changes between baseline and endline across most study variables. Participants' knowledge scores increased from  $6.57 \pm 1.68$  at baseline to  $8.00 \pm 1.17$  at endline, indicating a mean difference of 1.43 ( $t(29) = 4.16, p < .001, \text{Cohen's } d = 0.76$ ), suggesting a moderate effect size. Similarly, attitude scores improved from  $6.97 \pm 1.83$  to  $10.13 \pm 2.62$ , with a mean difference of 3.17 ( $t(29) = 5.01, p < .001, d = 0.91$ ), also representing a moderate effect. However, no statistically significant changes were observed in perceived seriousness ( $6.30 \pm 1.51$  to  $7.17 \pm 2.60$ ;  $t(29) = 1.85, p = .075, d = 0.34$ ), perceived

benefit ( $7.40 \pm 2.16$  to  $8.10 \pm 1.92$ ;  $t(29) = 1.88, p = .070, d = 0.34$ ), perceived barriers ( $7.60 \pm 1.43$  to  $8.03 \pm 1.85$ ;  $t(29) = 0.81, p = .427, d = 0.15$ ), perceived efficacy ( $12.40 \pm 1.30$  to  $12.53 \pm 1.33$ ;  $t(29) = 0.51, p = .614, d = 0.09$ ), reinforcing factors ( $7.63 \pm 1.13$  to  $8.13 \pm 1.36$ ;  $t(29) = 1.53, p = .138, d = 0.28$ ), and enabling factors ( $8.47 \pm 1.76$  to  $8.60 \pm 1.48$ ;  $t(29) = 0.34, p = .734, d = 0.06$ ) (Table 5).

**Table 5: Paired t-test result for within-group comparison of predisposing, reinforcing, and enabling variables in the control group (baseline vs. endline)**

Variable	Maximum scale of measure	Baseline (M ± SD)	Endline (M ± SD)	Mean Difference	t(29)	p-value	Cohen's d
Knowledge	12	6.57 ± 1.68	8.00 ± 1.17	1.43	4.16	< 0.001	0.76
Attitude	16	6.97 ± 1.83	10.13 ± 2.62	3.17	5.01	< 0.001	0.91
Perceived seriousness	16	6.30 ± 1.51	7.17 ± 2.60	0.87	1.85	0.075	0.34
Perceived benefit	16	7.40 ± 2.16	8.10 ± 1.92	0.70	1.88	0.070	0.34
Perceived barrier	16	7.60 ± 1.43	8.03 ± 1.85	0.43	0.81	0.427	0.15
Perceived efficacy	16	12.40 ± 1.30	12.53 ± 1.33	0.13	0.51	0.614	0.09
Reinforcing factors	16	7.63 ± 1.13	8.13 ± 1.36	0.50	1.53	0.138	0.28
Enabling factors	16	8.47 ± 1.76	8.60 ± 1.48	0.13	0.34	0.734	0.06

*M = mean; SD = standard deviation. Mean difference is baseline–endline change. T (29) from paired t-tests (n = 30). Significance cut-offs: p < 0.05 (significant), Cohen's d = effect size*

*Within-group comparison of predisposing, reinforcing, and enabling variables in the experimental group (baseline vs. endline)*

A paired-samples *t*-test was conducted to assess the effect of the intervention on participants' knowledge, attitude, and related behavioural constructs. Knowledge scores increased markedly from baseline (M = 6.33, SD = 1.47) to endline (M = 10.60, SD = 1.22),  $t(29) = 12.12, p < .001, \text{Cohen's } d = 2.21$ . Attitude also improved significantly from baseline (M = 7.00, SD = 1.84) to endline (M = 12.53, SD = 1.22),  $t(29) = 12.25, p < .001, d = 2.24$ . Similarly, perceived seriousness

of child health conditions increased from M = 7.00 (SD = 1.72) at baseline to M = 13.20 (SD = 1.52) at endline,  $t(29) = 16.37, p < .001, d = 2.99$ . Perceived benefit improved significantly ( $t(29) = 11.60, p < .001, d = 2.12$ ), as did perceived efficacy ( $t(29) = 7.10, p < .001, d = 1.30$ ), reinforcing factors ( $t(29) = 22.61, p < .001, d = 4.13$ ), and enabling factors ( $t(29) = 3.56, p = .001, d = 0.65$ ). Perceived barriers also increased significantly from baseline (M = 8.53, SD = 1.94) to endline (M = 11.07, SD = 1.84),  $t(29) = 4.98, p < .001, d = 0.91$ . This rise likely reflects participants' greater exposure to facility-level challenges (Table 6).

**Table 6: Paired t-test result for within-group comparison of pre-disposing, reinforcing, and enabling variables in the experimental group (baseline vs. endline)**

Variable	Maximum scale of measure	Baseline (M ± SD)	Endline (M ± SD)	Mean Difference	t(29)	p-value	Cohen's d
Knowledge	12	6.33 ± 1.47	10.60 ± 1.22	4.27	12.12	< .001	2.21
Attitude	16	7.00 ± 1.84	12.53 ± 1.22	5.53	12.25	< .001	2.24
Perceived seriousness	16	7.00 ± 1.72	13.20 ± 1.52	6.20	16.37	< 0.001	2.99
Perceived benefit	16	7.00 ± 1.68	12.20 ± 2.34	5.20	11.60	< 0.001	2.12
Perceived barrier	16	8.53 ± 1.94	11.07 ± 1.84	2.53	4.98	< 0.001	0.91
Perceived efficacy	16	11.57 ± 1.17	12.90 ± 0.88	1.33	7.10	< 0.001	1.30
Reinforcing factors	16	7.30 ± 1.18	12.80 ± 1.00	5.50	22.61	< 0.001	4.13
Enabling factors	16	8.37 ± 2.19	9.67 ± 2.34	1.30	3.56	0.001	0.65

*M = mean; SD = standard deviation. Mean difference is baseline–endline change. t(29) from paired t-tests (n = 30). Significance cut-offs: p < 0.05 (significant), Cohen's d = effect size*

## Discussion

The intervention's outcomes were assessed by comparing outcomes between the experimental and control groups at the 10th-week follow-up period. Baseline assessments confirmed the comparability of the two groups, ensuring the validity of subsequent comparisons. Furthermore, the study hypotheses were systematically tested to address the study aim, providing empirical evidence on the effectiveness of the intervention.

The PRECEDE model offers a valuable framework for understanding these outcomes. Faith-based and community leaders in this study served as reinforcing factors, offering social support, value alignment, and trusted advocacy for positive health behaviours. Their influence sustained care-seeking behaviours by validating health messages through religious teachings and community trust networks. This aligns with Opara et al, who highlighted how cultural and religious structures act as both predisposing factors, shaping beliefs and attitudes toward healthcare, and as reinforcing structures, influencing decision-making within Nigerian communities (23). Similarly, Nwakanma et al showed how faith community-led initiatives mitigated maternal and child health injustices by leveraging religious platforms for advocacy and service promotion, creating enabling environments where previously marginalised groups gained access to care (24). Collectively, these findings emphasise the importance of leveraging culturally relevant, community-trusted structures to strengthen the enabling and reinforcing components of behavioural change. In this study, the observed community responsiveness and ownership of care-seeking messages disseminated through faith and community actors reflect the operationalisation of the PRECEDE model. Such a participatory approach is critical for sustaining behaviour change in resource-constrained and culturally diverse settings.

### *Outcome of the intervention on predisposing factors*

The predisposing factors considered in this study were knowledge, attitude, and perception. Firstly, knowledge was assessed through true/false statements on care-seeking best practices: timely immunisation, exclusive breastfeeding, handwashing, use of insecticide-treated nets, recognition of danger signs (e.g., persistent fever, vomiting, respiratory difficulty), and the importance of professional medical care. This also demonstrates awareness of preventive and care-seeking norms. Attitudinal dispositions were gauged using Likert-type items addressing emotional engagement and commitment to timely treatment, complete immunisation, skilled birth attendance, and postnatal care. Perceptions were then analysed in four domains: perceived seriousness (understanding the risks of delayed care, non-immunisation, reliance on traditional remedies), perceived benefits (belief in the protective value of prompt care, immunisation, and professional advice), and perceived barriers (challenges such as provider availability, cost perceptions, preference for traditional medicine, and distance to facilities). Finally,

perceived self-efficacy was measured through items assessing confidence in recognising illness, accessing services, following medical guidance, and seeking professional help when unsure.

At baseline, predisposing variables including knowledge, attitude, perceived susceptibility, and benefits showed no statistically significant differences between the control and experimental groups. This suggests good initial comparability and strengthens the internal validity of the intervention study. The similar starting points across these constructs provide confidence that any observed changes at follow-up are likely attributable to the intervention rather than pre-existing group differences. However, significant baseline differences were observed in perceived barriers and self-efficacy. The experimental group reported higher perceived barriers and lower self-efficacy, both with moderate to large effect sizes. These differences may have placed the experimental group at a relative disadvantage initially, suggesting that any improvements in these areas post-intervention would be particularly meaningful.

At the 10<sup>th</sup> week post-intervention follow-up, the intervention led to significant improvements in key predisposing factors, knowledge, attitudes, and perceptions (25). This outcome also mirrors findings by Abiyu et al, who reported that behaviour change communication improved complementary feeding practices through enhanced caregiver knowledge and perceived benefits (26).

### *Outcome of the intervention on reinforcing factors*

The reinforcing factors examined in the study included whether caregivers felt that their family supports and encourages them to take their child to the hospital when sick, whether community leaders actively urge mothers to seek hospital care for ill children, whether religious gatherings incorporate health education messages promoting hospital visits, and whether local health programmes exist within the community to advocate for timely medical care.

At baseline, the reinforcing factors showed no statistically significant differences between the control and experimental groups. This suggests good initial comparability and strengthens the internal validity of the intervention study. The assessment of this social support and positive community norms showed a significant increase after the intervention. This aligns with Flax et al, who reported that when community gatekeepers and social networks actively support health messages, they foster sustainable changes in child nutrition practices in Nigeria (27).

This highlights the PRECEDE-PROCEED model's focus on reinforcing factors as essential drivers of sustained behaviour change. In this study, religious and community leaders, acting as change agents, offered moral and emotional support, thereby improving community acceptance of positive care-seeking behaviours.

### *Outcome of the intervention on enabling factors*

The enabling factors evaluated in the study included the proximity of healthcare facilities, caregivers' access to these facilities whenever their child required care, the availability of free paediatric services through government provision, and the receipt of financial support for purchasing medications when they were not provided free of charge. Even though the proximity to a healthcare facility remained unchanged, this study did not record significant improvements in enabling factors, including access to financial resources and paediatric care waivers. These findings emphasise that while knowledge and motivation are vital, environmental and resource conditions are crucial for turning intentions into actions, as highlighted in the PRECEDE model. The influence of the intervention on enabling factors is relatively modest compared to reinforcing and predisposing factors. This suggests that although behavioural change interventions can enhance knowledge, attitudes, perceptions, and social support in a short period, improvements in enabling factors such as proximity to healthcare facilities and financial resources are often limited by structural and systemic barriers that extend beyond the scope of community-based interventions.

This outcome corroborates Edward et al, who highlighted that in Kenya and Zambia, while community mobilisation improved service demand, persistent barriers such as transportation costs, healthcare workforce shortages, and service accessibility limited the full translation of behavioural intention into service utilisation (28). Similarly, Le Roux argued that in South Africa, even when caregivers are motivated and supported, poor access to quality healthcare services and financial hardship can inhibit optimal care-seeking behaviours (29).

Therefore, while social-behavioural engagement successfully increased personal motivators (predisposing factors) and external social support (reinforcing factors), its limited effect on enabling factors highlights the need for multi-sectoral collaboration. Combining health system improvements such as fair financing, infrastructure development, and better supply chain management with behavioural interventions is crucial to achieve sustainable improvements in care-seeking behaviours.

### *Study limitations*

Despite the study's strengths, several limitations should be acknowledged. The primary limitation is the use of a sample size calculation designed for binary outcomes in a study measuring continuous variables. While the observed effects were large and statistically significant, this represents a methodological shortcoming in the planning phase. The intervention duration was relatively short, with follow-up assessment conducted only at week 10, limiting insight into the long-term sustainability of behavioural changes. Second, the study's geographical coverage was restricted, as only one Local Government Area per senatorial district was included, which may limit the generalizability of the findings to other

regions. Finally, the reliance on self-reported behavioural outcomes introduces the possibility of social desirability bias, which could affect the accuracy of participants' responses.

## **Conclusion**

This study demonstrates that a community-based, theory-driven social-behavioural intervention can substantially improve the determinants that shape maternal care-seeking intentions in low-resource settings. Guided by the PRECEDE-PROCEED model, the intervention significantly enhanced mothers' knowledge, attitudes, perceptions, and social reinforcement from family and community structures. The minimal improvement in enabling factors highlights the ongoing need for system-level investments, such as improved facility access, affordable services, and dependable health personnel, to support behavioural readiness through practical opportunities for action. Together, these findings emphasise the importance of integrating behavioural and social change strategies within broader health system strengthening efforts.

By engaging faith-based and community influencers, the intervention fostered local ownership and collective responsibility for child health. Scaling such participatory, theory-informed models across similar contexts could accelerate progress toward equitable maternal and child health outcomes in Nigeria and comparable low- and middle-income countries.

## **Abbreviations**

LMICs: Low- and Middle-Income Countries

IMCI: Integrated Management of Childhood Illnesses

## **Declarations**

**Ethics Approval and Consent to Participate:** Ethical approval for this study was initially obtained from the Babcock University Health Research Ethical Committee (BUHREC), approval number: BUHREC 749/24 on October 30, 2024. This was subsequently approved by the Cross River State Health Research Ethics Committee, REC No. CRS/MH/HREC/2024/VOL.091 on the 7th of February 2025.

**Data Availability:** The data supporting the findings of this study are available from the corresponding author upon reasonable request.

**Competing Interests:** The authors report no conflicts of interest or other disclosures relevant to this work.

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**Author contributions:** IGO: Conceptualisation; methodology; investigation; data curation; formal analysis; project administration; writing – original draft; visualisation. ANO: Supervision; methodology; validation; writing—review and editing; resources.

LSA: Supervision; validation; writing review and editing; resources; funding acquisition (if applicable).

VO: Data curation, investigation, writing review, and editing.

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