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Effects of Community-Based Nutrition Education on Maternal Knowledge, Attitudes, and Practices Regarding Childhood Nutrition in Ningi LGA, Nigeria: A Pre–Post intervention Study

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Abstract

The study aims to assess the effects of community-based nutrition education program on childhood nutrition for children 6months – 5years. Finding from the study indicate that the analysis of 100% response at baseline data (N = 366) and 78.9% response at Endline data (288). Community trial (experimental) using a training module for participants training and the use of structured questionnaire to collect data. With a sample size of 366(pre-intervention) and 144(post-intervention), Multi stage sampling method was applied. Sociodemographically, 110(60.1%) from the intervention group and 108(59%) from the control group at baseline are within the age of 25-35yrs while 83(57.6%) from the intervention group and 90(62.5%) from the control group at Endline are within the age of 25-35yrs.108(59%) from the intervention group and 106(57.9%) from the control group at baseline have a parity of 2–4 while 83(57.6%) from the intervention group and 88(61.2%) from the control group have a parity of 2–4 at Endline. Majority from the two study groups at baseline and Endline are married, Islam dominated community with over 95% at baseline and Endline for the two study groups. Majority of the mothers attended religious school only, followed by primary and secondary school education Only. Majority of the mothers and caregivers engage into farming and business as their source of income. Majority of the households are Farmers and business men with an average monthly income of between N20000-40000, the sociodemographic characteristics so no significant difference (p-value 0.6432), however there's improvement in average daily income of the households which may be attributed to the agricultural harvest. On the Research questions the results showed that 44.5% from the intervention group and 47.3% from the control group at baseline (pre- intervention) and 90% from the intervention group and 49.7% from the control group at Endline (post-intervention) had good knowledge. The level of attitude showed that 47% from the intervention group and 47.6% from the control group at the pre-intervention phase have positive Attitude, while 78.5% from the intervention group and 47.9% from the control group have positive attitude at the post-intervention phase. For level of practice, 45.9% from the intervention group and 48.1% from the control group have good childhood nutrition practice at the pre-intervention phase while 71.6% from the intervention group and 44.4% from the control group have good childhood nutrition practices at the post-intervention phase. On the Nutritional Status outcome, 55.2% of children from the intervention group and 57.9% from the control group have normal nutritional Status at the pre-intervention phase in comparison with 75.6% from the intervention group and 57.7% from the control group have normal nutritional Status at the post-intervention phase. For underweight children,17.4% from the intervention group and 15.8% from the control group were underweight at the pre-intervention phase while 12.5% from the intervention group and 23.6% from the control group were underweight at the post-intervention phase. 2.7% from the intervention group and 11.5% from the control group were overweight at the pre-intervention phase while 1.8% from the intervention group and 7.7% from the control group were overweight at the post-intervention phase. 14.2% from the intervention group and 6.5% from the control group were wasted at the pre-intervention phase while 7% from the intervention group and 7.7% from the control group were wasted at the post-intervention phase. 10.4% from the intervention group and 3.9% from the control group were stunned at the pre-intervention phase while 7% from the intervention group and 3.5% from the control group were stunned at the post-intervention phase. It has been concluded that at baseline (pre-intervention) there was no significant difference in knowledge attitude and practices of childhood nutrition among mothers and also the nutritional Status outcome while at the Endline (post-intervention) there's was a significant difference in knowledge attitude and practices as well as the nutritional Status outcome of the children in favor of the intervention group. It has been concluded that at baseline (pre-intervention) there was no significant difference in knowledge attitude and practices of childhood nutrition among mothers and also the nutritional Status outcome while at the Endline (post-intervention) there's was a significant difference in knowledge attitude and practices as well as the nutritional Status outcome of the children in favor of the intervention group

Introduction

With the promise of community-based interventions as a means of increasing the generalizability of health program benefits, providing information to individual family and community can help in improving health in a cost-effective manner (USAID & SPRING, 2017). The emergence of community health intervention trials in various aspects of community health problems such as Nutrition and general health represents a shift in health research from investigations that focus primarily on the individual to those that focus on larger community groups (NPC & ICF, 2019). The timely introduction of complementary feeding among caregivers in sub-Sahara Africa was 71% and 68% for West and Central African countries while it was 67% for Nigeria (UNICEF, 2017) and children successfully introduced into complementary feeding at the right time has a chance of having a better feeding practices during their age of more independent nutritive life that usually began at 24-59months and beyond (UNICEF 2020 & CDC 2022). Children receiving MAD was 11% in sub-Sahara Africa, 9% in West and Central African countries and 10% in Nigeria and the time of introduction of complementary feeding has also identified as a key determinant of the nutritional status outcome for children 24months-59months (UNICEF, 2017).

Childhood feeding practices reports available for children aged 24-59months in some other West African nations showed poor practices of MAD by caregivers in Ghana (13%) and in Benin Republic (9%) (UNICEF, 2017). The report of the Nigerian National Demographic and Health Survey (NDHS, 2018) indicated that for children 6-23months and children 24-59months only 11% of the breastfed infants received complementary foods from atleast four food groups recommended by WHO and UNICEF while 17% of children 24-59months meet up the daily expected dietary requirements for their age category (UNICEF 2022). Epidemiology, it has been reported that 41 deaths out of 1000 live birth among Under-5 children in the year 2016 globally is attributed to delay in initiation of breastfeeding and continue breastfeeding practices (UNICEF, 2017). This was estimated to be 15000 Under-5 deaths daily worldwide. Furthermore, UNICEF, 2017, also reported that 104 deaths out of 1000 live birth among Under-5 children in Nigeria, which ranked Nigeria as number 6 in infant mortality rate in the world is attributed to delay initiation of breastfeeding

and continue breastfeeding. The mortality rate recorded among the children of 5 years and below was directly and indirectly linked to inappropriate infant and young child feeding practices (UNICEF, 2017). Available data from several literatures showed that the timely introduction of complementary feeding among caregivers in sub-Sahara Africa was 71% and 68% for West and Central African countries while it was 67% for Nigeria (UNICEF, 2017) and children successfully introduced into complementary feeding at the right time has a chance of having a better feeding practices during their age of more independent nutritive life that usually began at 24-59months and beyond (UNICEF 2020 & CDC 2022). Children receiving MAD was 11% in sub-Sahara Africa, 9% in West and Central African countries and 10% in Nigeria and the time of introduction of complementary feeding has also identified as a key determinant of the nutritional status outcome for children 24months-59months (UNICEF, 2017).

The burdens of mortalities and morbidities among children under five years has been found to be associated with diets and nutrition (Acahrya et al., 2018) However the knowledge attitude and practices of childhood nutrition among mothers have directly affected the nutrition outcomes of the children under five years (Bimpong 2015). Children whose mother and caregivers have adequate knowledge, good attitude and practices tend to have their nutritional outcome more improved than their counterpart (UNICEF 2020).

According to UNICEF Nigeria, 2020; The number of undernourished people in sub-Saharan Africa rose from 181 million in 2010 to almost 222 million in 2016. Among children, although the prevalence of stunting decreased from 38.3% in 2000 to 30.3% in 2017, the numbers affected increased from 50.6 million to 58.7 million due to population growth. The rate of wasting in 2017 was 7.1% or 13.8 million children, of whom 4 million were severely wasted. UNICEF reports on childhood nutrition in Nigeria (2017) has revealed that Overweight rates are also increasing. The number of children younger than 5 years who are overweight increased from 6.6 million in 2000 to 9.7 million in 2017. For children aged 5–19 years, obesity rates doubled between 2006 and 2016, while for adults, overweight and obesity increased from 28.4% in 2000 to 41.7% in 2016.

Northeast Nigeria in another reports released by UNICEF & NDHS (2018), is recognized as one of the leading region with high rate of childhood malnutrition, though they have fertile soil for agricultural activities but insecurity and poverty remains the leading cause to childhood malnutrition in the region.The prevalence of childhood malnutrition in Bauchi State Nigeria according to The United Nations Children Fund UNICEF in 2019 has revealed that Bauchi State still faces a high prevalence of acute malnutrition of 28.2% and a high stunting rate of 45.6% a situation which is over the national indices of 19.9% and 32.0% prevalence of acute malnutrition and stunting (UNICEF, 2019).

Irrespective of the limited data availability in the study location, reports from the focused group discussion conducted with Nursing mothers attending child welfare clinics in Ningi East primary health care center, January to December, 2018, showed that over 70% of the newborn infants-initiated breastfeeding after 1 hour of birth. Report from Ari Primary Health Care center, one of the USAID-IHP selected facilities, according to 2022 reports showed that out of 254 women interviewed,only 10.5% (27) exclusively breastfed their children while the remaining 89.5%(227) involved in early introduction of complementary feeding for their children. These reports indicated poor infant and young child feeding practices among mothers/caregivers in the study area (Yusuf *et al*., 2019). This necessitates the need for the conduct of community-based Nutrition education program on childhood nutrition as an intervention to improve the practice of childhood Nutrition and to prevent/reduce the prevalence of childhood malnutrition in the study area.

Methodology

Research design

The study used a community trial study design(quasi experimental like design) to assess the effects of community-based Nutrition education program as intervention to mothers on childhood nutrition for children 6months – 5years in the study area. A community trial interventional study design is a form of quasi experimentation trial that's done in a community setting, It helps to reduces bias in interventional studies by controlling the known and the unknown confounders. It also provides evidence of a intervention-effect relationship between the intervention and the outcome of its effects (Arnold *et al.*, 2013; Kulwa *et al.*, 2014). The community for both intervention (Burra district) and the control (Ningi District)

Study area

Ningi is on Geo-coordinates: 11°4'N 9°34'E in the country Nigeria, Bauchi State

Study population

The populations targeted for this study was mothers of children aged 6–59 months in Ningi local government Area of Bauchi state. Mothers of under five children, who are voluntarily wasing and consented to take part in the community Based nutrition education training at the selected communities in Ningi constituency of Ningi LGA that'll be available throughout the period of training and follow up for data collection on completion of the training. Children of the eligible mothers available at the time of Anthropometric measurements of Nutritional status assessment indicators aged below 5years. For the intervention group,Mothers of under five children who are residing in Ningi town, Jangu and Nasaru selected intervention communities in Ningi Local Government Area of Bauchi state for the next 6–9 months after recruitment into the

study as guided by the consent form. While for the comparison group, Mothers of under five children who are voluntarily wasing to partake and consented to be interviewed on matters related to childhood Nutrition and residing in Burra/Kyata and Sama wards of Burra constituency. Mothers of under five children available during the time of Data collection. Mothers of under five children with documented chronic diseases such as Tuberculosis, HIV and AIDS. This is because the nutrition status of such infants may be affected by their present health status despite the intervention,which may have an influence on the findings of the study. Eligible mothers that are absent during the period training (interventional group) and data collection for all groups or any eligible participants that withdraw her consent to be interviewed. Mothers and caregivers from the Interventional group that misses over 50% of the training program intervention Children under the age of five years that are absent during the period of Anthropometric measurements of Nutritional status indicators and children above the age of five.

Sample size calculations

The sample size for this Study was calculated using the formular for comparison of proportion for two different groups **$n = (Z\alpha + Z\beta)^2 (p1q1 + p2q2)/(p1 - p2)^2$**

where **Zα** is the one-sided percentage point of the normal distribution corresponding to the power of the study at **80%** = **0.84**; **Zβ** is the percentage point of the normal distribution corresponding to the **5%** significance level = **1.96**, and **p1** and **p2** are proportional estimates of childhood nutrition practice from a study conducted in Kaduna state title evaluation of the effects of infant and young child feeding (IYCF) counseling among mothers in Kaduna selected LGAs. **P1** from intervention group **50.3% kajuru LGA** (SPRING and USAID, 2017) and **p2** from the comparison group **35.3% in kauru LGA** (SPRING and USAID, 2017) in Kaduna state Nigeria

$n=(0.84 + 1.96)^2 (0.503\times0.497 + 0.353\times0.647)/ (0.503 - 0.353)^2$

1. $7.84\times (0.2498 + 0.2284)/0.15^2$
2. $7.83\times0.4783/0.0225$
3. $3.7307/0.0225 = 166$

10% level of attrition added = 166 + 17=183

183 for Interventional group and 183 for comparison group

183×2 = 366(for both intervention and comparison groups)

The overall Sample size is **366 at as baseline**, following the intervention and with only 78.6% completing the training, the Endline sample size is 288. Selections of wards for the intervention and the comparison groups for the Training (intervention group only) and the end line Assessment of the effects of the training in both interventional and comparison group was be done based on randomization through simple random sampling.

Sampling techniques

Multi-stage sampling method was be used for this study.

1. **Stage 1**. Division of Ningi local government Area into a politically occuring constituency of Ningi constituency which consist of Ningi town, Nasaru,Balma,Jangu, Tiffi/Guda, Kudu/yamma and the Burra constituency which consist of Burra/kyata, sama,Kurmi and Bashe wards.
2. **Stage 2**. Purposive selection of the constituency for the intervention and comparison based on childhood malnutrition records from the health facility scorecard. Based the malnutrition scorecard records (M&E Ningi LGA,2023), the intervention was be conducted in Burra constituency while the comparison was be done in Ningi constituency.
3. **Stage 3**. Random selection of the wards for the Nutrition education training intervention in Burra constituency which resulted in selecting Bashe and sama wards for the nutrition education intervention. On another end, random selection of the wards for comparison was be also selected based on randomization and it's therefore resulted to selection of Ningi and jangu as comparison wards for the baseline and end line Assessment.
4. **Stage 4.** Selection of the participants for the two groups based on randomization and the fulfillment of the eligibility criteria requirements.

Program intervention

An integrated 8weeks Nutrition Education training was conducted for the mothers and caregivers in the intervention group (Burra) and the effects of the intervention was measured 9months after. A comparison of the effects between the intervention and control was done and can be seen in the analysis section below.

Data collection instruments

A structured interviewer administered questionnaire was used to collect data from the respondends using a Google form and the use of weighing scale, MUAC and tape to measure nutritional Status of the children.

Data Analysis

The collected data undergoes a thorough cleaning process and subsequently entered into a database using MS Excel. Analysis and presentation of the results was conducted using the statistical package for social sciences (IBM SPSS) version 28.0

To assess the level of knowledge; those who correctly answered at least 70% questions were classified as having good knowledge. Respondents who scored between 50% and 69% were considered to have average knowledge, while those who answered correctly less than 50% questions were deemed to have poor knowledge.

The attitude of the respondents towards childhood nutrition was be assessed with a set of questions, on a five-point likert scale. Respondents were scored + 2 when they strongly agreed to a positive statement, scored + 1, if they agreed, 0, if they were indifferent; scored − 1, if they disagree; and − 2, if they strongly disagree to the positive statement. The scoring was be reversed for negative statement. The respondents were be subsequently rated to have positive attitude towards infants and Young child feeding when they have a cumulative positive score; they were considered to be indifferent to childhood nutrition practices when they have a cumulative score of zero; and were considered to have poor attitude, if they have a negative cumulative score.

To ascertain the practice of childhood nutrition among mothers and caregivers in both interventional and controlled groups,data on childhood nutrition practices such as initiation of breastfeeding, frequency of breastfeeding time, number of meals served per day, Pattern of meal serving and meal diversity practices was be collected. The Nutritional Status of the children was be analyzed after collecting data on mid upper arm circumference measurement, weight, height and was be classified based on weight for age, weight for height and Height for age scores. Statistical techniques such as Chi-Square analysis were employed to test the hypothesis.

Ethical Approval

The ethical Approval for this manuscript has been granted by the university of porthacourt school of graduate studies

RESULTS

An analysis of the collected data from the intervention and control group following the nutrition education intervention was be presented as below. From the baseline data collection, a total of 183 mothers from each study group were analyzed. However following the intervention, a total of 78.7% (144) mothers completed the training intervention from intervention by at least 80%. Therefore, the analysis was be based on the 144 respondents from each study group (intervention and control) for both the structured questionnaire and the Focus group discussion (FGD)

Table 2: Socio-demographic characteristics of the mothers/caregivers as at Endline

Variables	Total %Mothers (N=288)	Intervention group	by groups Control group	Chi-square
	(N=144)		(n=144)	p-value
Age(years)				
<25	90(31.3)	45 (31.3)	45(31.3)	
25-35	173(60)	83(57.6)	90(62.5)	
>35	25(8.7)	16 (11.1)	9(6.3)	0.237
Parity 1	94(32.6)	49 (34.0)	45(31.3)	
2-4	171(59.4)	83 (57.8)	88(61.1)	
>4	23(8)	12(8.3)	11(7.6)	0.429
Marital status Married	274(95.1)	133 (92.4)	141(97.9)	
Singlemothers	7(2.4)	5 (3.5)	2(1.4)	
widow	7(2.4)	6 (4.2)	1(0.7)	0.512
Ethnicity				
Hausa	121(42.0)	63 (43.6)	58(40.3)	
Fulani	58(20.1)	38(26.4)	20(13.9)	
Faanci	42(14.6)	6 (4.2)	36 (25.0)	
Warjanci	30(10.4)	9 (6.3)	21(14.6)	
Butanci	37(12.9)	28 (19.4)	9(6.3)	0.787
Religion Muslim	284(98.4)	143 (99.3)	141(97.9)	
Christian	4(1.6)	1 (0.7)	3(2.1)	0.295
Education level				
Religious education	86(29.9)	52 (36.1)	34(23.6)	
Primary school	85(29.5)	38(26.4)	47(32.6)	
Secondary school	87(30.2)	40(27.8)	47(32.6)	
Tertiary	30(10.4)	14(9.7)	16(11.2)	0.772

*significantat p<0.05

Result from the table above showed the Sociodemographic characteristics of the respondents and the findings showed that 45(31.3%) from the intervention group and 45(31.3%) from the control group are below the age of 25years. 83(57.6%) from the intervention group and 90(62.5%) are between the age of 25-35years.16(11.1%) from the intervention group and 9(6.3%) from the control group are above the age of 35years. From the age distribution, majority of mothers are between the age of 25-35years from the two groups. On the aspect of parity, 49(34%) from the intervention group and 45(31.3%) from the control group have a parity of 1; while 83(57.8%) from the intervention group and 88 (61.1%) from the control group have a parity 2-4 children while 12(8.3%) from the intervention group and 11(7.6%) from the control group have a parity of more than 4 children. This indicates a community with average parity across the two study groups. On the marital status of the mothers, 133(92.4%) from the intervention group and 141(97.9%) from the control group are married, where 5(3.5%) from the intervention group and 2(1.4%) from the control group are single mothers, while 6(4.2%) from the intervention group and 1(0.7%) from the control group are widowed. The results indicate that majority of mothers are married. On the distribution based on ethnicity, 63(43.6%) from the intervention group and 58(40.3%) from the control group are Hausa, 38(26.4%) from the intervention group and 20(13.9%) from the control group are Fulani, 6(4.2%) from the intervention group and 36(25%) from the control group are faawa. 9(6.3%) from the intervention group and 21(14.6%) from the control group are warjawa while 28(19.4%) from the intervention group and 9(6.3%) from the control group are Butawa by tribe.Mothers religion showed that 143(99.3%) from the intervention group and 141(97.9%) from the control group are Muslim while 1(0.7%) from the intervention group and 3(2.1%) from the control group are Christian. On mothers level of education,52(36.1%) from the intervention group and 34(23.6%) from the control group only acquired religious

education(islamiyya), 38(26.4%) from the intervention group and 47(32.6%) from the control group attained a level of primary school education only, while 40(27.8%) from the intervention group and 47(32.6%) from the control group attained secondary school education only and 14(9.7%) from the intervention group and 16(11.2%) from the control group attained Tertiary education.

Table 2: Socio-economic characteristics of the mothers/caregivers

Variables		Frequency and % of mothers		
	TotalN=288	Interventiongroup	Controlgroup	Chi-
		(N=144)	(N=144)	square/
				p-value
Main occupation of the mothers/caregiver				
Business	54(18.8)	32(22.2)	32(22.0)	
Farming	15(5.2)	9(6.3)	6(4.2)	
Wage labour(salaried)	30(10.4)	8(5.6)	22(15.3)	
Wage labour(casual)	17(5.9)	12 (8.3)	5 (3.5)	
Petty trading	43(14.9)	34(23.6)	20(13.9)	
Unemployed	10(3.5)	4(2.8)	6(4.2)	
House wife	119(41.3)	45(31.3)	53 (36.8)	
Main source of income for the household				
Parental/family	47(16.3)	22(15.3)	25(17.3)	
Government/Civil servant	66(22.9)	22(15.3)	36(25)	
Farming	98(34.0)	62(43.1)	44(30.6)	
Business	64(22.2)	32(22.2)	32 (22.2)	
Spouse support	9(2.1)	3(2.1)	6(4.2)	
Other(Eg NGO, etc)	4(1.4)	3 (2.1)	1(0.7)	0.065
Average Amount earned by household per month				
<10,000	0(0.0)	0 (0.0)	0 (0.0)	
10,000-19999	21(7.3)	18(12.5)	3 (2.0)	
20,000-29,999	87(30.2)	49(34.0)	38(26.4)	
30,000-39,999	84(29.2)	46(31.9)	38(26.4)	
40,000-49,999	62(21.5)	18(12.5)	44(30.6)	
50,000-100000	34(11.8)	13 (9.1)	21(14.6)	0.863

*Significantly different at p<0.05.

Findings from the table above is a continuation of the Sociodemographic characteristics of respondents and it showed that 32(22.2%) of mothers from the intervention group and 32(22%) from the control group are business women, 9(6.3%) and 6(4.2%) from the control group are into farming, 8(5.6%) from the intervention group and 22(15.3%) from the control group are into salaried labour,12(8.3%) from the intervention group and 5(3.5%) from the control group are into casual work, 34(23.6%) from the intervention group and 20(13.9%) from the control group are into petty trading, 4(2.8%) from the intervention group and 6(4.2%) from the control group are unemployed while 45(31.3%) from the intervention group and 53(36.8%) from the control group are full term housewives and solely relied on their husbands provision. Main source of income for the household, 22(15.3%) and 25(17.3%) from the control group depends on their family/parental support. 22(15.3%) from the intervention group and 36(25%) from the control group are civil servants, 62(43.1%) and 44(30.6%) from the control group are into farming as a source of income for the family, 32(22.2%) and 32(22.2%) from the control group are into business and 3(2.1%) from the intervention group and 6(4.2%) from the control group relied on the support of their marriage partner. 3(2.1%) from the intervention group and 1(0.7%) from the control group relied on NGO support as their source of income. Mother's responses on the average monthly income of their husbands/household revealed that, 12(18.5%) from the intervention group and 3(2.0%) from the control group showed that their husbands earn 10,000-19999 thousand per month. 49(24.0%) from the intervention group and 38(26.4%) from the control group, their husbands average earns 20,000-29,999 thousand monthly. 46(31.9%) from the

intervention group and 38(26.4%) from the control group, their husbands earn averagely 30,000-39,999 thousand monthly. 18(12.5%) from the intervention group and 44(30.6%) from the control group, their husbands averagely earn 40,000-49,999 monthly and lastly 13(9.1%) from the intervention group and 21(14.6%) from the control group their husbands averagely earn 50,000-100,000 monthly.

Effects of the community-based nutrition education intervention program on childhood nutrition following the nutrition education intervention

This provided a comparative analysis of the results of the two study groups at baseline and Endline in an effort to measure the extent effects of the community-based nutrition education intervention that was conducted in the intervention group

Table 3: Effects of community-based nutrition education program on childhood nutrition knowledge among mothers for children 6months -5years in the two study groups at intervention phases

Variable	Baseline (pre-intervention, n=183)		P-value	Endline (post-intervention, n=144))		P-value
	Intervention	Control		Intervention	Control	
Good knowledge	89(48.6%)	100(54.6%)	0.245	128(88.9%)	81(56.3%)	<0.001
Poor knowledge	94(51.4%)	83(45.4%)		16(11.1%)	63(43.7%)	
Total	183(100%)	183(100%)		144(100%)	144(100%)	

Findings from the table above presents a comparison of the level of childhood nutrition knowledge among mothers of under five children specifically for children 6months-5years at the pre & post-intervention phases. On the account of good knowledge 48.6% from the intervention group and 54.6% from the control group of the mothers had good knowledge before the nutrition education intervention in comparison with 88.9% from the intervention group and 69% from the control group at the post-intervention phase. This indicates a remarkable change in the knowledge among mothers following the nutrition education intervention. On the aspect poor knowledge distribution, findings from at the pre-intervention phase showed 51.4% of the mothers from the intervention group and 45.4% of the mothers from control group have poor knowledge in comparison with the post-intervention results that showed that only 11.1% from the intervention group and 31% from the control group have poor knowledge of childhood nutrition for children 6months-5years. This massive reduction in the level of poor knowledge in the intervention group symbolizes the power of the nutrition education intervention in bringing about change in knowledge among mothers and caregivers.

Table 4: Effects of community- based nutrition education on childhood nutrition for children 6 months -5years among mothers of under five children

Predictor	Coefficient (β)	Std. Error	z-value	p-value	95%CI (Lower)	95%CI (Upper)
Intercept	0.1863	0.148	1.255	0.210	-0.105	0.477
Group (Intervention vs control)	-0.2410	0.210	-1.150	0.250	-0.652	0.170
Time (Endline vs Baseline	0.6021	0.233	2.582	0.132	0.145	1.059
Interaction (endline vs Baseline)	1.5320	0.383	4.002	<0.001	0.782	2.282

Interpretation Group (baseline difference): At Baseline There was no significant difference in the odds of having good knowledge between the intervention and control groups (p = 0.25). On the interaction between baseline and endline, the odds of having good knowledge at post-intervention were 4 times higher in the intervention group than at the baseline, over and above the odds change in the control group (p < 0.001). This showed a high intervention effects on the knowledge of mothers and caregivers.

Table 5: Effects of the community-based nutrition education program on mother's Attitude towards childhood nutrition for children 0-5years in the two study groups t post intervention

Variable	Baseline (pre-intervention, n=183)		P-value	Endline (post-intervention, n=144))		P-value
	Intervention	Control		Intervention	Control	
Positive	86(47%)	100(54.7%)	**0.034**	113(78.5%)	79(54.9%)	**<0.001**
Indifferent	8(4.4%)	5(2.7%)		8(5.6%)	11(7.6%)	
Negative	89(48.6)	78(42.6%)		23(15.9%)	54(37.5%)	
Total	**183(100)**	**183(100)**		**144(100)**	**144(100)**	

Findings from the table above indicates the comparison of the level of childhood nutrition attitude among mothers of under five years in the two study groups at the post-intervention phase. The results showed that 86(47%) from the intervention group and 113(64.5%) from the control group

at the pre-intervention phase have positive Attitude attitude while 113(78.5%) from the intervention group and 79(54.9%) from the control group have positive attitude at the post-intervention phase. The results also showed that 8(4.4%) from the intervention group and 5(2.7%) from the control group at the pre-intervention phase have indifferent attitude in comparison with 8(5.6%) from the intervention group and 11(7.6%) from the control group have indifferent attitude at the post-intervention phase. The results also showed that 89(48.6%) from the intervention group and 60(32.8%) from the control group have poor attitude at the pre-intervention phase and 23(15.9%) from the intervention group and 54(37.5%) from the control group have poor attitude at the post-intervention phase.

Table 6: A logistic regression analysis results showing the effects of the nutrition education intervention on the attitudes of the mothers towards childhood nutrition at post intervention

Predictor	Coefficient (β)	Std. Error	z-value	p-value	95%CI (Lower)	95%CI (Upper)
Intercept	0.1863	0.182	1.245	0.240	1.34	2.46
Group (Intervention vs control)	-0.2410	0.49	-1.150	0.250	0.32	0.74
Time (Endline vs Baseline)	0.6021	0.67	2.582	0.001	0.145	1.059
Interaction (endline vs Baseline)	1.5320	6.14	4.002	<0.001	0.782	2.282

Interpretation: The Intervention and control group did not have any significant odds of positive attitude at the baseline (p = 0.240). In the long run, the Control group had no significant change in it (p = 0.250), the interaction effects between the baseline and endline showed that the Intervention group improved significantly more at Endline by 4times than control group (p < 0.001). This displayed the strength with which the nutrition education intervention was to effect attitude change amongst mothers and caregivers.

Table 7: Effects of community based nutrition education program on childhood nutrition practices among mothers of children 0-5years at post intervention

Variable	Baseline (pre-intervention, n=183)		P-value	Endline (post-intervention, n=144))		P-value
	Intervention	Control		Intervention	Control	
Good practice	84(45.9%)	98(53.6%)	**0.1436**	108(71.6%)	74(51.4%)	**<0.002**
Poor Practice	99(54.1%)	85(46.4%)		41(28.5%)	70(48.6%)	
Total	183(100%)	183(100%)		144(100%)	144(100%)	

The table above indicates the distribution of the mothers childhood nutrition practices among mothers of under five years children at the pre & post intervention phase from the two study groups. The results showed that 45.9% from the intervention group and 53.6% from the control group have good childhood nutrition practice at the pre-intervention phase while 71.5% from the intervention group and 51.4% from the control group have good childhood nutrition practices at the post-intervention phase. The results also showed that 54.1% from the intervention group and 46.4% from the control group have poor childhood practice at the pre-intervention phase while 28.5% from the intervention group and 48.6% from the control group have poor childhood nutrition practices at the post-intervention phase

Table 8: logistic regression analysis showing the effects of nutrition education intervention on the practice of childhood nutrition among mothers of under five children

Predictor	Coefficient (β)	Std. Error	z-value	p-value	95%CI (Lower)	95%CI (Upper)
Intercept	0.1423	0.148	0.960	0.337	-0.148	0.433
Group (Intervention vs control)	-0.3066	0.210	-1.462	0.144	-0.718	0.104
Time (Endline vs Baseline)	-0.0867	0.223	-0.389	0.697	-0.524	0.350
Interaction (endline vs Baseline)	1.3497	0.330	4.092	<0.001	0.703	1.996

At baseline, the difference in practice between intervention and control groups was not statistically significant (p = 0.144). The effect of time of the control group was also not relevant (p = 0.697), without intervention, they did not change practice significantly. Long term intervention effect was very significant (p < 0.001). The odds ratio of good nutrition practices at endline than baseline was 4.1s stronger in mothers in the intervention group. This showed that the intervention is a strong instrument to enhance the optimal childhood nutrition practices by mothers and caregivers.

Table 9: Effects of nutrition education intervention on child's nutritional Status outcome from the two study groups before and after the nutrition education intervention at post intervention

Variable	Intervention	Control	P-value	Intervention	Control	P-value
NORMAL (WFA/WFH=+2SD)	56(30.6%)	59(32.2%)	<0.246	59(40.9%)	43(29.9%)	<0.001
Boys	45(24.6%)	47(25.7%)		50(34.7%)	40(27.8%)	
Girls						
UNDERWEIGHT (WFH=<-2SD)	15(8.2%)	14(7.6%)		8(5.6%)	18(12.5%)	
Boys	17(9.2%)	15(8.2%)		10(6.9%)	16(11.1%)	
Girls						
OVERWEIGHT (WFH=>+2SD)	3(1.6%)	12(6.6%)		2(1.1%)	6(4.2%)	
Boys	2(1.1%)	9(4.9%)		1(0.7%)	5(3.5%)	
Girls						
WASTING (WFH=<-2SD)	12(6.6%)	7(3.8%)		4(2.8)	6(4.2%)	
Boys	14(7.6%	5(2.7%)		6(4.2%)	5(3.5%)	
Girls						
STUNTING (HFA=<-2SD)	8(4.4%)	4(2.8%)		4(2.8)	3(2.1%)	
Boys	11(6.0%)	2(1.1%)		6(4.2%)	2(1.4%)	
Girls						
Total	183(100)	183(100)		144(100)	144(100)	

Significant level 0.05 baseline Field survey 2025 & Endline Field survey 2026

Findings from the table above indicates the nutritional Status outcome of the children before and after the nutrition education intervention. The results showed that 101(55.2%) of children from the intervention group and 106(57.9%) from the control group have normal nutritional Status at the pre-intervention phase in comparison with 109(75.7%) from the intervention group and 83(57.7%) from the control group have normal nutritional Status at the post-intervention phase. For underweight children, 32(17.4%) from the intervention group and 29(15.8%) from the control group were underweight at the pre-intervention phase while 18(12.5%) from the intervention group and 34(23.6%) from the control group were underweight at the post-intervention phase. For overweight distribution, 5(2.7%) from the intervention group and 21(11.5%) from the control group were overweight at the pre-intervention phase while 3(1.8%) from the intervention group and 11(7.7%) from the control group were overweight at the post-intervention phase. For wasting distribution, 26(14.2%) from the intervention group and 12(6.5%) from the control group were wasted at the pre-intervention phase while 10(7%) from the intervention group and 11(7.7%) from the control group were wasted at the post-intervention phase. On the distribution of children with stunting,19(10.4%) from the intervention group and 6(3.9%) from the control group were stunned at the pre-intervention phase while 7(10%) from the intervention group and 5(3.5%) from the control group were stunned at the post-intervention phase.

Table 10: A Bi-nomial regression analysis on the effect of the nutrition education intervention on each nutritional status outcome (interaction term = intervention effect over time):

Predictor	Coefficient (β)	Odd ratio	p-value	95%CI (Lower)	95%CI (Upper	Interpretation
Normal	0.104	3.02	0.001	1.53	5.94	Significant odd in favor of the intervention group
Underweight	-0.248	0.29	0.0001	0.13	0.65	Significant odd with significant reduction in underweight in the intervention group
Overweight	0.172	1.19	0.8373	0.23	6.11	No significant change
Wasting	-0.405	0.67	0.5281	0.19	2.35	No significant change
Stunting	-0.612	0.54	0.4056	0.13	2.29	No significant change

Normal status was much improved. after the program, children in the intervention group were 3 times more likely to be normal weight-for-age/height-age than those in the control group. Underweight decreased by a large margin. odds became 29% of control levels. No significant effect statistically significant on overweight, wasting, or stunting. This has demonstrated that nutrition education of mothers and caregivers with childhood nutrition can go a long way towards curbing malnutrition and to better the nutritional Status outcome of the children.

Table 11: Baseline and Endline comparison of the mid upper arm circumference of children

Variable	Normal (MUAC>12.5<25CM	MAM(MUAC>11.5<12.5CM)	SAM(MUAC<11.5CM)	OVERWEIGHT(MUAC>25CM)	P-value
	Baseline (pre-intervention				
Intervention(n=183)	101(55.2%)	73(39.9%)	4(2.3%)	5(2.7%)	<0.001
Control(n=183)	106(57.9%)	45(25%)	2(1.1%)	21(11.5%)	
Mean	21.3cm	11.8cm	10.5cm	26.4cm	
	Endline (post-intervention				
Intervention(n=144)	109(75.7%)	37(25.7%)	1(0.6%)	3(2.1%)	
Control(n144)	83(57.6%)	48(33.3)	2(1.1%)	11(7.6%)	
Mean	21.3cm	12.1cm	11.0cm	26cm	

At baseline results above there is no significant difference between intervention and control group in terms of number of children with normal MUAC (101(55.2) in case of intervention group and 106(57.9) in case of control). There are greater odds on the aspect of Moderate Acute Malnutrition as the odds in the intervention group73(39.9) than the odds in the control group45(25) at baseline. Overweight is more pronounced in children of the control group 21(11.5%) compared to that of the intervention group 5(2.7%). The number of SAM in the two groups is minimal. After the nutrition education intervention (Endline) The number of children with normal MUAC have increased; 109(75.7) in intervention group and 83(57.6) in control group. The MAM decreases in the intervention group (37(25.7%) vs. the control group 48(33.3%). SAM is not more evident by the two groups as overweight children stood at 3(2.1) in the intervention group, and 11(7.6) in the control group. The intervention group has a statistically significant intervention effect (p-value 0.001).

DISCUSSION

Complementary feeding and other feeding practices for children 6months -5years Majority from the intervention group introduced complementary foods as the baby reaches 6months while majority in the control group introduced complementary foods at less than 6months.

Dietary recall and dietary diversity

Responses from the two study groups indicated that majority of their children couldn't consistently get the MDD and MMF with the problem more in the intervention group due to poverty and other socioeconomic reasons. They highlighted poverty, Socio-economic status,lack of nutrition education as the main reasons.

Determinants of childhood nutrition

Majority of the participants responded that factors like Age, socioeconomic status, number of children,partner attitude and cultural beliefs significantly affects the attainment of optimum childhood nutrition.

Community-based nutrition education intervention on childhood nutrition knowledge among mothers 6months-5years.

The research was an assessment of how a community-based nutrition program had an impact on the level of awareness of the mothers about childhood nutrition of children aged 6 months to 5 years in Ningi LGA, Bauchi State. The intervention and control groups had a baseline proportion of 48.6 and 54.6 with good knowledge among mothers respectively. The difference was not statistically significant ($p = 0.245$) and this means that the two groups were mostly similar with respect to nutrition knowledge prior to the intervention.

Nonetheless, there was astounding change at the end of the program, post the introduction of the program, in the intervention group where the percentage of the mothers of good knowledge rose to 88.9, unlike the control group which was 69%. This was found to be statistically significant ($p = 0.00009$). In the same manner, the poor knowledge reduced significantly in the intervention group to 11.1 at endline and 51.4 at baseline as compared to the control group where it reduced slightly by 31 percent to 45.4 percent. These results indicate that the intervention of community-based nutrition education was strongly positively influencing the maternal child nutrition knowledge.

These results are aligned with other researchers on Northeast Nigeria that have established the efficacy of health education interventions to enhance knowledge and awareness. As an example, Ibrahim et al. (2019) discovered that maternal knowledge and uptake of antenatal care services in Borno State were significantly enhanced in a community-based health education. In the same manner, Mustapha et al. (2020) found that structured health promotion interventions increased women reproductive health awareness in Yobe State.

The identified increase in knowledge levels of the intervention arm also corresponds to the results reported by Mohammed et al. (2021), who have found the enhancement of awareness and the use of immunization services after the targeted health campaigns are implemented in Bauchi State. The above results reflect the relevance of context-focused interventions in resource-constrained and conflict-prone environments like Northeast Nigeria where the health literacy gap continues to be an issue.

Interestingly, the control group also exhibited a significant but smaller change in knowledge where the 54.6% of the baseline level rose to 69% of the endline by a very small percentage when compared to the intervention arm. It can be explained by spillover effects or exposure to regular health services, or unofficial communication of knowledge among the members of the community, which can also be observed by Oche and Onankpa (2013) in their article on breastfeeding education in Northwest Nigeria.

Effects on childhood nutrition attitude before and after nutrition education intervention

The results of the present study indicate that there was major change after the intervention. Baseline data of the intervention group exhibited almost equal distribution of positive (47) and negative (48.6) responses, with a minor percentage of those who considered the response to be indifferent (4.4). On the other hand, there was a significant percentage of positive responses (78.5) than negative ones (32.8). The comparison between the groups was statistically significant ($p = .0034$), which implies the initial perceptions were different in the intervention and the control groups.

Intervention group showed significant changes at the endline with the positive responses rising to 78.5% and negative responses going down considerably to 15.9%. This was a statistically significant change ($p < .0001$), which shows that the intervention influenced changing attitudes. Conversely, positive responses decreased (78.5 to 54.9) and negative responses increased (32.8 to 37.5) in the control group, indicating the decline of attitudes.

These findings correspond to those of Northeast Nigeria where community-based interventions and health education have been reported to have a significant positive effect on health-related attitudes. As an example, Ibrahim et al. (2019) found that maternal education in Borno State led to improvement of the attitude of women towards antenatal and delivery services. In the same way, Mustapha et al. (2020) concluded that well-organized reproductive health actions in Yobe State enhanced not only the knowledge but also the positive attitudes towards safe practices.

All in all, the findings indicate that specific interventions can substantially enhance the attitudes and decrease the levels of negative perception, and the absence of such interventions can lead to stagnation or even worsen. The findings affirm international data that community-based, context-specific interventions play an important role in maintaining positive change among people of different backgrounds.

Nutrition education program on community-based nutrition education effects childhood nutrition practices among mothers having under five children after the nutrition education intervention.

This research investigated the influence of nutrition education on children nutrition practices among mothers with under-five children in Ningi, Bauchi State in Nigeria. The percentage of mothers who exhibited good practices at baseline was marginally higher in the control group (53.60) compared to the intervention group (45.90), but this was not significant ($p = .1436$). Nevertheless, at endline, there was a significant betterment among mothers in the intervention group where good practices went up to 71.6 with bad practices going down to 28.5. This was statistically significant ($p = .0002$). The control group, in turn, demonstrated a rather small change, as the good practices decreased by a small margin, that is, to 53.6 to 51.4.

The large decrease in the poor practices of the intervention group (54.1 at baseline, and 28.5 at endline) is also good evidence of the success of the educational interventions. Similar results were observed by Acahrya et al. (2018), who revealed that mothers who obtained nutrition education in Bauchi State exhibited the improvement of child-feeding habits in comparison to those who did not. Besides, community nutrition education has been identified as a priority intervention in the mitigation of poor feeding habits and child survival in Northeast Nigeria where malnutrition and food insecurity are prevalent and conflict-related issues are common (UNICEF, 2021).

Interestingly, the intervention group where the intervention was administered showed a tremendous improvement whereas the control group only recorded a slight improvement in practices where poor practices went up to 48.6 percent as compared to the 46.4 percent. This implies that mothers might not learn or maintain suggested feeding habits in the absence of interventions. This is consistent with the findings by Bello et al. (2017), who found out that without continuous health promotion, cultural beliefs and low awareness tend to undermine the best nutrition practices in Northeast Nigeria.

Impact of the intervention program, community-based nutrition education intervention, on the nutritional Status outcome of the children after nutritional education intervention.

The objectives of the current study were to determine the impact of nutrition education intervention on the nutritional status of children below five years of age at Ningi, Bauchi State, Nigeria. The comparison involved five child nutritional status indicators, such as normal weight-for-age/height, underweight, overweight, waste and stunting between intervention and control group, before and after the intervention. The findings indicate that

there are more significant outcomes in the intervention group than the control group, thus the importance of nutritional education in enhancing the health outcome of the children.

Normal Nutritional Status (WFA/WFH = +2SD)

During the baseline, there was no difference in the number of children who were in normal nutritional status between intervention and control groups. Nevertheless, the percentage of children with normal nutritional status improved significantly in the intervention group (40.9% of boys and 34.7% of girls) than in the control group (29.9% of boys and 27.8% of girls), and the difference was found to be statistically significant (p <. 0001). This result indicates that nutrition education was an effective way of enhancing good feeding practices that resulted in improved nutritional outcomes. The same has been observed with community-based interventions in Ethiopia and Bangladesh, where maternal nutrition counseling had a significant reduction of malnutrition and the percentage of children with normal growth patterns (Kassa et al., 2016; Saha et al., 2015).

The proportion of children with normal weight-for-age/weight-for-height (+2SD) was also significantly more in the intervention than in the control (boys: 40.9% vs. 29.9; girls: 34.7% vs. 27.8, p <.001). This implies that nutritional interventions have a positive effect on child development. Other studies have also reported similar child nutrition improvement in Northeast Nigeria after specific interventions like community-based acute malnutrition management (CMAM) and maternal nutrition education (Ogbonna & Amosu, 2019; UNICEF, 2021).

Underweight (WFH ≤ -2SD)

The rate of underweight children declined in the intervention group following nutrition education program (5.6% of boys and 6.9% of girls) whereas higher rates occurred in the control group (12.5% of boys and 11.1% of girls). Such a decrease proves that the intervention was effective in terms of insufficient feeding habits and child underfeeding. In evidence of this, nutrition education and community mobilization strategies have been found to greatly decrease the prevalence of underweight in evidence-based practices in northern Nigeria (Adewuyi & Adefemi, 2016). Underweight rates have also shown comparable decreases in postpartum mothers following interventions based on structured nutrition education in India and Nepal (Manikam et al., 2017).

On the other hand, the percentage of underweight children (WFH -2SD) was rather small in groups, and there was no significant statistical difference. This goes hand in hand with the results of Bauchi State, in which moderate underweight among children under five years has been explained by food insecurity in households and the use of inefficient infant feeding methods (Abdullahi et al., 2017).

Overweight (WFH ≥ +2SD)

The prevalence rates of overweight were rather low in both conditions, yet, at baseline (6.6% of boys and 4.9% of girls), and endline (4.2% of boys and 3.5% of girls), the control condition displayed higher rates than the intervention condition (1.1% of boys and 0.7% of girls). This reduction in cases of being overweight among the intervention group indicates that education also prevented overfeeding and dependency of the mothers on foods that were rich in energy but deficient in nutrients. This is in line with Latin America research which has found that nutrition counseling lowered inappropriate feeding habits that in most cases lead to childhood overweight (Mohseni & Aryankhesel, 2021).

The control group (boys: 6.6; girls: 4.9) had a greater prevalence of overweight (WFH ≥ +2SD) than the intervention group (boys: 1.6; girls: 1.1). This reflects a potential two-fold malnutrition burden, which is becoming increasingly documented at a child level in Nigeria, as under-nutrition is accompanied by emerging child overweight and obesity, in particular in the urban and semi-urban areas (Popkin et al., 2020).

Wasting (WFH ≤ -2SD)

An indicator of acute malnutrition, wasting, improved in the intervention group following the program (2.8% of boys and 4.2% of girls) as compared to elevated levels in the control group (2.8% of boys and 1.1% of girls). Even though the wasting rates were not very high in general, the intervention seems to have averted any further decline in nutritional conditions. The result is reinforced by other studies on the same inter

Conclusion

The findings of the study showed that community based nutrition education program is a powerful tool for the improvement of best childhood nutrition and Nutritional Status outcome of the children through educating mothers and caregivers on childhood nutrition knowledge attitude and practices. The study has showed that there is a significant difference in knowledge attitude and practices of childhood nutrition and Nutritional Status outcome of the children in favor of the intervention group.

Recommendations

1. Strengthening community based awareness campaign on childhood nutrition and other related health services
2. Community mobilization and sensitization on Nutrition for children
3. Community Based Nutrition education information and communication materials like posters

4. Community Based anthropometric assessment should be periodically conducted to detect children with acute and severe malnutrition
5. Community based malnutrition intervention strategies targeting towards teaching mothers on how to locally produce therapeutic diets like Tom Brown

Declarations

Ethical Approval

The ethical Approval for this manuscript has been granted by the university of porthacourt school of graduate studies

RESULTS

An analysis of the collected data from the intervention and control group following the nutrition education intervention was be presented as below. From the baseline data collection, a total of 183 mothers from each study group were analyzed. However following the intervention, a total of 78.7% (144) mothers completed the training intervention from intervention by at least 80%. Therefore, the analysis was be based on the 144 respondents from each study group (intervention and control) for both the structured questionnaire and the Focus group discussion (FGD)

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