

# Maternal knowledge in complementary feeding following Baby Friendly Community Initiative in Koibatek, Kenya

Mildred Maingi<sup>1</sup>  | Judith Kimiywe<sup>2</sup> | Sharon Iron-Segev<sup>1,3</sup>

<sup>1</sup>School of Nutritional Sciences, The Hebrew University of Jerusalem and The International School of Agricultural Sciences, Rehovot, Israel

<sup>2</sup>School of Public Health and Applied Human Sciences, Department of Food Nutrition and Dietetics, Kenyatta University, Nairobi, Kenya

<sup>3</sup>School of Nutritional Sciences, Peres Academic Center, Rehovot, Israel

## Correspondence

Mildred Maingi, School of Nutritional Sciences, The Hebrew University of Jerusalem and The International School of Agricultural Sciences, PO Box 12-761001, Rehovot, Israel.  
Email: maingimildred@gmail.com

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## Abstract

The Kenyan Ministry of Health has developed a National Strategy on Infant and Young Child Feeding with the goal of improving feeding practices for infants and children. In order to promote appropriate infant feeding, the government has explored implementation of the Baby Friendly Community Initiative (BFCl). This study assessed maternal knowledge of attributes of complementary feeding following implementation of BFCl in Koibatek, Kenya. A randomized control study composed of 270 mother–infant pairs previously enrolled in a BFCl programme in Koibatek was conducted. The study found that a significantly greater number of mothers in the intervention group were more knowledgeable about proper breastfeeding and complementary feeding aspects compared with controls ( $P \leq 0.001$ ). About half (53%) of mothers in the intervention group had high knowledge scores in comparison with 20% of mothers in the control group. When the relationship between mothers' knowledge and complementary feeding practices (minimum meal frequency, minimum dietary diversity and minimum acceptable diet) was assessed, significant associations were observed ( $P = 0.010$ ,  $P \leq 0.001$  and  $P \leq 0.001$ , respectively). The odds of having a high knowledge score regarding complementary feeding practices were significantly higher for the intervention group compared with the control group (odds ratio [OR]: 25.98, 95% confidence interval [CI] 13.62–49.55,  $P \leq 0.001$ ). The BFCl intervention effectively improved mothers' knowledge on complementary feeding and correlated with improved feeding practices.

## KEYWORDS

child feeding, community based, complementary feeding, infant and child feeding, knowledge, nutrition education

## 1 | INTRODUCTION

The Global Strategy for Infant and Young Child Feeding was developed by the World Health Organization (WHO) and UNICEF. The

overall aim was to protect, promote and support optimal breastfeeding and complementary feeding practices, thus improving infants and children's nutrition and health status, growth, development and survival (WHO, 2003a). Based on the strategy's core values,

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Kenya, through its Ministry of Health, developed the National Strategy on Infant and Young Child Feeding with a similar goal of improving infants' and children's feeding practices (MOH, 2013). Baby Friendly Community Initiative (BFCI) intervention was built on the principles of the global strategy. BFCI refers to a community-based intervention whose objective is to initiate, protect and promote appropriate infant and child feeding, that is, both breastfeeding and complementary feeding and optimal child health in the community (MOH, 2016). Kenya's Ministry of Health has adopted BFCI, whose implementation involves a series of steps as described in Table 1.

Among the challenges to infant feeding in developing countries is inadequate knowledge on how to feed children, which eventually increases vulnerability to malnutrition in most infants and children (WHO, 2003b). A mother's nutritional knowledge greatly impacts the nutrition status of her child because she has the capacity to make nutrition conscious decisions for feeding her child (Foote & Marriott, 2003). In Kenya, major gaps identified in complementary feeding include inadequate knowledge, use of nutritionally inadequate complementary food, low infant and child feeding frequency and introducing of complementary foods too early (MOH, 2013). The BFCI implementation in Kenya targets these barriers in efforts to improve infant and young child feeding practices.

In order to assess the feasibility and effectiveness of BFCI in addressing poor infant and young child feeding practices in Kenya, the Ministry of Health implemented a pilot in Koibatek Sub-County, a rural setting (Kimani-Murageet al., 2015). A formative study carried out in the area before the intervention was rolled

### Key messages

- BFCI improved knowledge levels regarding child feeding among mothers, which led to better feeding practices.
- BFCI supported mothers in initiating, protecting and promoting appropriate infant and child feeding practices at the community level.
- Involvement of community health workers, conducting mothers to mothers support groups and nutrition education were all instrumental in improving child health.

out found that mothers had little knowledge on infant and child feeding (APHRC, 2017). BFCI entailed developing messages aimed at improving mothers' knowledge on various food to be fed based on age of the child, frequency of feeding, inclusion of specific food groups and feeding during illness. The current research is a sub-study that aimed at assessing post-intervention achievements by evaluating the ability of the BFCI trial in improving mothers' knowledge on complementary feeding following its implementation in Koibatek Sub-County.

**TABLE 1** The eight steps of Baby Friendly Community Initiative

#### BFCI implementation steps

1. Have a well-documented Maternal Infant and Young Child Nutrition (MIYCN) policy statement that is communicated to health care providers, community health workers and community members in a consistent manner.
2. Have routine trainings for health facility workers and community health workers on the MIYCN policy, equipping them with necessary knowledge and skills to implement it.
3. Promote and support optimal maternal nutrition among mothers and their families.
4. Educate all pregnant women and lactating women and their families on breastfeeding benefits and risks of artificial feeding.
5. Support mothers in initiating breastfeeding within the first hour of birth and help them to maintain exclusive breastfeeding up to 6 months. Address any breastfeeding-related issues.
6. Encourage mothers to continue breastfeeding their children for 2 years or beyond, as well as provide appropriate, adequate and safe complementary feeding to their children. Provide holistic care and stimulation of children.
7. Ensure there is a baby friendly environment that is supportive to breastfeeding families.
8. Promote collaboration among health care workers, community mothers support groups, mother to mother support groups and the respective local community.

<sup>a</sup>Source: Adapted from Ministry of Health, Kenya (MOH, 2016).

## 2 | METHODS

### 2.1 | Study design

The study adopted the methodology previously described in Maingi, Kimiywe, and Iron-Segev (2018). It was part of a larger randomized control trial that had recruited 812 mother–infant pairs. The intervention group had received the BFCI package that included mother support groups, child feeding education resources, personalized nutrition counselling and introduction of income generating activities whereas the control group received the standard care offered in the health facilities. The project had been implemented in 13 community units (six from intervention group and seven from control group). Community units are geographically defined units, mostly equal to a village or sub-location and usually have a population size of approximately 5,000 people.

In the current study, a sample size of 294 mother and child pairs was determined to be sufficient. It was calculated using Yamane formula (Israel, 1992) and was based on 812 mother–infant pairs (population in main study), a precision of 0.05 and 95% confidence level. Study participants were selected through a two-stage sampling procedure. Six community units (three from intervention group and three from control group) were randomly selected. The sample size of 294 was distributed proportionately in the two study groups. However, a total of 270 mother and child pairs was obtained representing a response rate of 92%. This study included mothers who had children aged 6–23 months, had initially been

recruited in the main BFCI project and were living in their respective community units where they had been recruited. Those who had moved from one arm to another, that is, from intervention to control and vice versa, were excluded from the study.

The design and reporting of this study adhered to the Consolidated Standards of Reporting Trials (CONSORT) guidelines (Moher et al., 2001). The flow diagram of participants' enrolment, allocation and analysis is summarized in Figure 1.

11 and 12 to 23 months). The questions were based on WHO guiding principles on complementary feeding of a breastfed child (WHO, 2003b) and BFCI monitoring protocols (MOH, 2014). The overall nutrition knowledge score for each respondent was ascertained by the number of correct responses. Respondents with higher scores reflected higher knowledge on complementary feeding compared with those with lower scores.

## 2.2 | Measurement variables

### 2.2.1 | Maternal knowledge on complementary feeding

Maternal knowledge was assessed using a set of 10 questions on various aspects of complementary feeding, recommended breastfeeding duration, weaning age, minimum number of food groups, frequency of feeding and feeding amounts according to a child's age (6 to 8, 9 to

### 2.2.2 | Maternal knowledge scores

Maternal knowledge score on complementary feeding was based on two scales: '1' and '0'. For every correct answer, a score of '1' was awarded whereas for every wrong answer, a score of '0' was awarded (Karimi, Sani, Ghorbani, & Danai, 2014). Out of a maximum score of 10, a total score for each of the mothers was computed. The mothers' knowledge on complementary feeding was divided into three categories: a score of 1–3 (low knowledge), a score of 4–7 (medium knowledge) and a score of 8–10 (high knowledge).

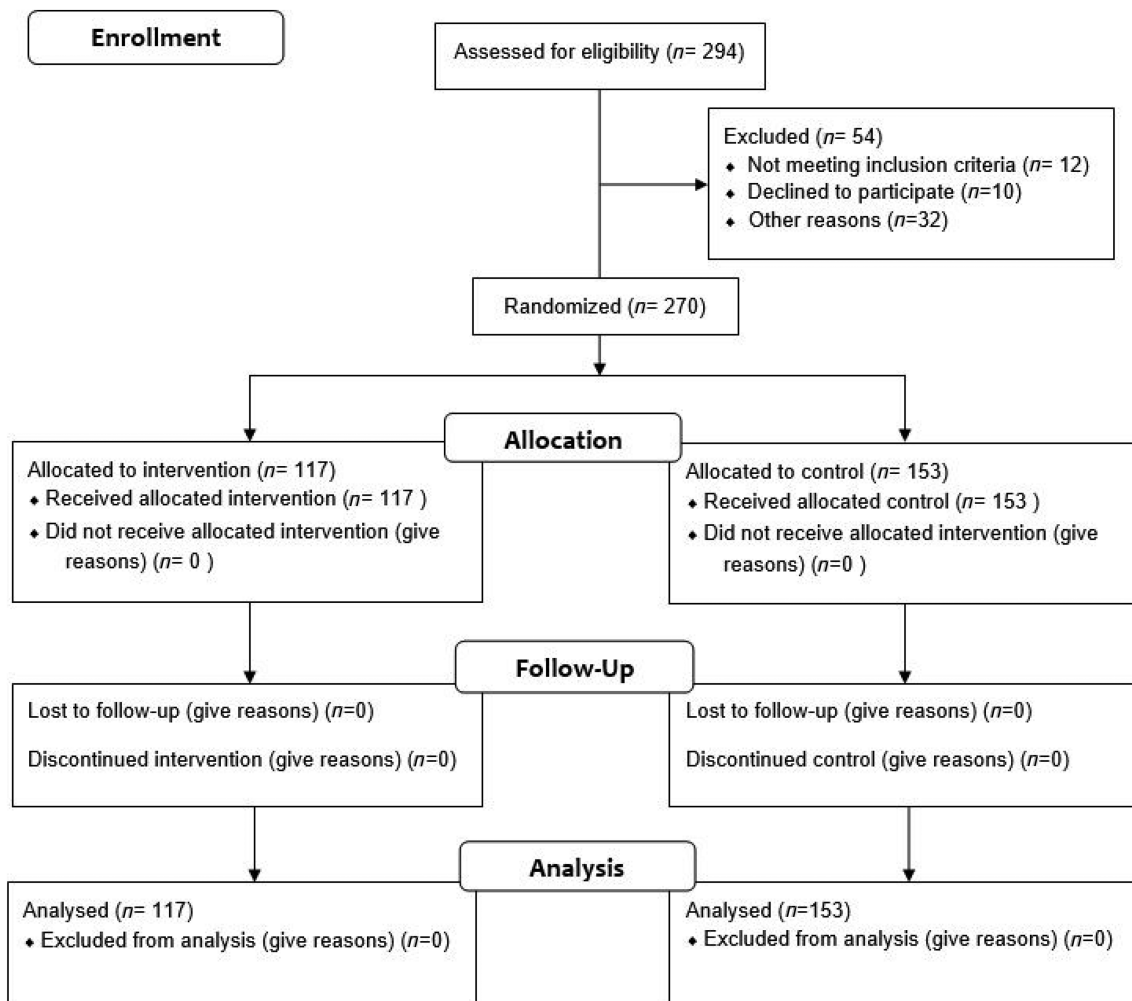


FIGURE 1 CONSORT flow diagram

Complementary feeding practices were then examined against categories of mother's knowledge (high, medium and low knowledge).

### 2.2.3 | Complementary feeding practices

A 24-h dietary recall was used to assess complementary feeding practices, and the three WHO indicators for assessing infant and young child feeding, that is, minimum meal frequency, minimum dietary diversity and minimum acceptable diet, were used to characterize child feeding practices (WHO, 2007). The 24-h recall was considered a suitable method for assessing dietary intake as this was a large study and the use of an interactive tool helped obtain a detailed record of foods consumed (Willett, 2012). Dietary recall was conducted by trained local researchers who interviewed mothers on foods consumed within the last 24 h.

#### *Minimum meal frequency*

This is defined as a breastfed child 6–8 and 9–23 months feeding 2 and 3 times a day, respectively, as well as a non-breastfed child 9–23 months feeding 4 times a day.

#### *Minimum dietary diversity*

This is defined as children 6–23 months consuming at least four food groups out of the seven recommended food groups: grains, roots and tubers; legumes and nuts; dairy products (milk and yogurt); flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables.

#### *Minimum acceptable diet*

This is defined as children 6–23 months who have attained both minimum meal frequency and minimum dietary diversity.

### 2.3 | Data analysis

Data were entered in Statistical Package for Social Sciences (SPSS) version 17.0 and exported for analysis using Stata version 14 (Stata Corporation, College Station, TX). Descriptive statistics are presented in tables. The relationship between the two groups (intervention and control arms) and the maternal knowledge was assessed using Pearson's chi-squared test.

Logistic regression analysis was then performed to determine the association between BFCI intervention (intervention and control arms), socio-demographic factors and maternal knowledge on complementary feeding. Bivariate analysis using the logistic regression model was done to assess the relationship between the outcome (maternal knowledge) and BFCI (intervention vs. control as the reference). Second, the adjusted multivariate analysis was conducted where the relationship between the two variables was assessed using a logistic regression model that controlled for other

confounding factors: age of mother, level of education attained, marital status, mother's religion and household's main source of income.

### 2.4 | Ethical approval and consent to participate

Research permit and ethics review and approval were obtained from the National Commission for Science, Technology and Innovation (NACOSTI/P/17/72297/16999) and Kenyatta University Ethical Review Committee (PKU/628/E60) respectively. Informed verbal consent was sought from all participating respondents.

## 3 | RESULTS

The current study included a total of 270 mothers and their children (6 to 23 months). Mothers with children aged 6 to 12 months represented 53% of the study population whereas 47% had children aged 13 to 23 months. Most of the mothers who took part in the study were aged between 21 and 30 years (62%) and were married (94%). A high proportion of the mothers practiced Christianity (82%) whereas a smaller proportion (18%) were Muslims. The highest level of education attained by most mothers (48%) was secondary/high school whereas only 8% had attained a college diploma.

### 3.1 | Maternal knowledge on complementary feeding

Overall, the study found that most (98%) mothers were knowledgeable regarding the age of introduction of solid food to an infant. On the question of introducing food to an infant, all mothers in the intervention group knew that in addition to breastfeeding, food should be introduced at 6 months. On duration of breastfeeding, a higher number of mothers in the intervention group (91%) stated that breastfeeding should continue up to at least 2 years compared with the 71% mothers in the control group ( $P \leq 0.001$ ). Overall, mothers in this study exhibited a medium knowledge level regarding complementary feeding. On proper child feeding practices, mothers in the intervention group were more knowledgeable. A higher percentage of mothers in the intervention group had more knowledge on feeding frequencies for children of 6 to 8, 9 to 11 and 12 to 23 months' age categories compared with mothers in the control group ( $P \leq 0.001$ ,  $P \leq 0.001$  and  $P = 0.037$ , respectively). Similarly, a higher number of mothers from the intervention group had more knowledge on the quantities a child should be fed in 6 to 8, 9 to 11 and 12 to 23 months' age categories compared with mothers from the control group community units ( $P \leq 0.001$ ,  $P \leq 0.001$  and  $P \leq 0.001$ , respectively) (Table 2).

**TABLE 2** Maternal knowledge statements on complementary feeding

	Control (N = 153)	Intervention (N = 117)	Total (N = 270)	P value
<b>Breastfeeding</b>				
Food should be introduced at 6 months in addition to breastfeeding	147 (96.1%)	117 (100.0%)	264 (97.8%)	0.030
Children should be breastfed up to a minimum of 2 years	109 (71.2%)	106 (90.6%)	215 (79.6%)	<0.001
<b>Complementary feeding</b>				
Complementary feeding should be introduced at 6 months	66 (43.1%)	78 (66.7%)	144 (53.3%)	<0.001
A child should consume a minimum of 4 food groups each day	86 (56.2%)	59 (50.4%)	145 (53.7%)	0.345
A child 6–8 months should consume 2–3 meals and 1–2 snacks per day	76 (49.7%)	88 (75.2%)	164 (60.7%)	<0.001
A child 9–11 months should consume 3–4 meals and 1–2 snacks per day	58 (37.9%)	87 (74.4%)	145 (53.7%)	<0.001
A child 12–23 months should consume 3–4 meals and 1–2 snacks per day	76 (49.7%)	73 (62.4%)	149 (55.2%)	0.037
A child 6–8 months should consume 2–3 tablespoons of food per day	91 (59.5%)	96 (82.1%)	187 (69.3%)	<0.001
A child 9–11 months should consume ½ of 250-ml cup of food per day	68 (44.4%)	89 (76.1%)	157 (58.1%)	<0.001
A child 12–23 months should consume ¾ to 1 of 250-ml cup of food per day	65 (42.5%)	81 (69.2%)	146 (54.1%)	<0.001

Note: Chi-squared test;  $P = 0.05$  at 95% confidence interval.

### 3.2 | Maternal knowledge scores

A higher proportion of mothers in the intervention group were more knowledgeable on breastfeeding and complementary feeding matters compared with those in the control group ( $P \leq 0.001$ ). About half, 53%, of mothers in the intervention group had high knowledge scores whereas only 20% of mothers in the control group had high knowledge scores (Table 3).

### 3.3 | Relationship between complementary feeding knowledge and practice

When the relationship between mothers' knowledge and complementary feeding practices (minimum meal frequency, minimum dietary diversity and minimum acceptable diet) was assessed, statistically significant associations were observed ( $P = 0.010$ ,  $P \leq 0.001$  and  $P \leq 0.001$ , respectively).

Children of mothers who had high knowledge on complementary feeding were more likely to achieve the recommended minimum meal

**TABLE 3** A comparison of maternal knowledge scores on complementary feeding between intervention and control groups

Maternal knowledge scores	Control	Intervention	P value
Low knowledge (1–3)	54 (35.3%)	1 (0.9%)	<0.001
Medium knowledge (4–7)	68 (44.4%)	54 (46.2%)	
High knowledge (8–10)	31 (20.3%)	62 (53.0%)	

Note: Chi-squared test;  $P = 0.05$  at 95% confidence interval.

frequency, minimum dietary diversity and minimum acceptable diet compared with those with low knowledge (Table 4).

### 3.4 | Relationship between BFCI and maternal knowledge on complementary feeding

The odds of attaining a high score on knowledge questions regarding complementary feeding were 26 times higher for mothers in the intervention group compared with those in the control group. An odds ratio (OR) of 25.98, 95% confidence interval (CI) 13.62–49.55 was calculated following adjustment for mother's age, education level, marital status, religion and main source of income ( $P \leq 0.001$ ) (Table 5).

## 4 | DISCUSSION

The findings of the current study indicate that the BFCI improved mothers' knowledge on complementary feeding aspects. Particularly, this study tested knowledge on recommended breastfeeding duration, initiation of complementary feeding, frequency of feeding for children of different age categories, feeding amounts for children according to age and minimum recommended food groups. A statistically significant higher proportion of mothers in the intervention group were more knowledgeable on breastfeeding and complementary feeding matters compared with those in the control group. Even after adjusting for confounding factors (age of mother, marital status, education level, religion and the main source of income), the results remained significant. Similar results have been found in studies on

**TABLE 4** Relationship between mothers' knowledge scores and complementary feeding

Minimum meal frequency (MMF)				
	Not attained MMF (N = 21)	Attained MMF (N = 233)	Total (N = 254)	P value
Knowledge score				0.010
Low knowledge	6 (28.6%)	38 (16.3%)	44 (17.3%)	
Medium knowledge	14 (66.7%)	108 (46.4%)	122 (48.0%)	
High knowledge	1 (4.8%)	87 (37.3%)	88 (34.6%)	
Minimum dietary diversity (MDD)				
	Not attained MDD (N = 102)	Attained MDD (N = 168)	Total (N = 270)	P value
Knowledge score				<0.001
Low knowledge	30 (29.4%)	25 (14.9%)	55 (20.4%)	
Medium knowledge	57 (55.9%)	65 (38.7%)	122 (45.2%)	
High knowledge	15 (14.7%)	78 (46.4%)	93 (34.4%)	
Minimum acceptable diet (MAD)				
	Not attained MAD (N = 93)	Attained MAD (N = 161)	Total (N = 254)	P value
Knowledge score				<0.001
Low knowledge	22 (23.7%)	22 (13.7%)	44 (17.3%)	
Medium knowledge	58 (62.4%)	64 (39.8%)	122 (48.0%)	
High knowledge	13 (14.0%)	75 (46.6%)	88 (34.6%)	

Note: Chi-squared test; P = 0.05 at 95% confidence interval.

**TABLE 5** Relationship between Baby Friendly Community Initiative intervention and maternal knowledge on complementary feeding

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Study group				
Control	1.00		1.00	
Intervention	6.23 (3.91–9.91)	<0.001	25.98 (13.62–49.55)	<0.001
Age of mother (years)				
<20	1.00		1.00	
21–30	0.65 (0.37–1.15)	0.148	0.26 (0.09–0.71)	0.004
31–40	0.11 (0.05–2.46)	0.000	0.03 (0.01–0.10)	0.000
41–49	0.27 (0.91–0.82)	0.022	0.01 (0.02–0.04)	0.000
Education level				
No education	1.00		1.00	
Primary	0.98 (0.63–1.52)	0.948	0.18 (0.10–0.31)	0.000
Secondary/tertiary	6.03 (2.42–14.59)	0.000	0.68 (0.23–2.01)	0.490
Marital status				
Unmarried	1.00		1.00	
Married	1.97 (0.61–6.36)	0.253	8.09 (2.47–26.4)	0.001
Religion				
Christian	1.00		1.00	
Muslim	0.52 (0.30–0.87)	0.015	3.53 (1.83–6.81)	0.000
Income source				
No income	1.00		1.00	
Merchant/trader	2.82 (1.38–5.75)	0.004	9.73 (2.97–31.83)	0.000
Permanent job	1.74 (0.99–3.05)	0.053	0.80 (0.34–1.86)	0.611

Note: Logistic regressions analysis; P = 0.05 at 95% confidence interval (CI). The multivariate model was adjusted for mother's age, education level, marital status, religion and main source of income.

Abbreviation: OR, odds ratio.



similar community-based interventions implemented in various countries (Kimani-Murageet al., 2015; Spence, Campbell, Crawford, McNaughton, & Hesketh, 2014; Zaman, Ashraf, & Martines, 2008).

For instance, a cluster randomized trial conducted in 2008–2010 in Australia found that there was higher maternal knowledge on complementary feeding that directly impacted on quality of children's diet following a health promotion intervention that involved peer discussions and nutrition education activities and materials (Spence et al., 2014). Similarly, a randomized control study done in rural Karnataka, India, among 138 infants found that those in intervention group had positive feeding behaviours in terms of high dietary diversity and feeding frequency compared with non-intervention infants (Kilaru, Griffiths, Ganapathy, & Shanti, 2005). An interventional study in Pakistan ( $n = 375$ ) that trained community health workers on complementary feeding counselling found that mothers in the intervention group who had been counselled had better knowledge on complementary feeding compared with those in the control group (Zaman et al., 2008). An interventional study in Malawi also found that group nutrition education positively influenced complementary feeding practices where children in the intervention group obtained better complementary feeding markers as opposed to those in the control group (Hotz & Gibson, 2005). Another prospective intervention study in Pakistan that included 586 mothers–infant pairs found that a nutrition education programme targeting mothers successfully reduced malnutrition where 36% of undernourished children progressed to have normal nutrition status (Zahid Khan, Rafique, Qureshi, & Halai Badruddin, 2013).

The findings of this study also indicated that knowledge translated to practice. Children belonging to mothers who had high knowledge on complementary feeding were more likely to achieve the recommended minimum meal frequency, minimum dietary diversity and minimum acceptable diet compared with those with low knowledge. These findings are comparable with a cross-sectional study conducted in Addis Ababa, Ethiopia, that found that maternal knowledge on complementary feeding influences minimum dietary diversity (OR: 1.98, 95% CI 1.11–3.53) (Solomon, Aderaw, & Tegegne, 2017). Likewise, a prospective intervention study in India that included 174 mothers found that the mothers from the intervention group who had received counselling on suitable breastfeeding and complementary feeding practices had improved overall child feeding practices such as superior dietary diversity and exclusive breastfeeding when compared with mothers in the control group (Haque et al., 2002). Generally, mothers in both the intervention and control groups had medium knowledge on overall complementary feeding aspects such as feeding amounts and feeding frequencies for children according to their ages.

A major limitation of this study was that it was carried out in a rural setting, thus the inability to generalize the findings to other settings. A rural setting was selected because rural communities have less access to services and information as compared with urban populations. The majority of the population were subsistence farmers with limited resources and thought to be culturally influenced by the traditions of the communities they belong to. The study site selected

also had challenges of food and nutrition insecurity because of long drought periods.

The strength of this study was its rigorous scientific design, a randomized control intervention that included a large sample size of 270 mother–child pairs. The fact that BFCI is a community-based intervention allowed for easy integration into existing community health systems, thus increasing chances for sustainability.

## 5 | CONCLUSION

This study demonstrates that BFCI, a community-based health promotion intervention, positively influences complementary feeding and consequent feeding practices. This therefore reveals that a community-based health promotion intervention can successfully improve child nutrition and help avert early childhood malnutrition. The findings provide important insights for planning and implementation of future interventions geared towards promoting child health.

Community health workers form a key pivotal point of contact with mothers and communities through the Community Health Strategy policy in Kenya. They are the link of communities with the health facilities, thus facilitating the continuum of maternal and child care through home visits, mother to mother support groups, community dialogue meetings and outreach programmes. It would be prudent for governments and relevant stakeholders to invest in health promotion through the Community Health Strategy in order to improve children's nutrition and overall well-being. This is achieved through strengthening community health systems, through deployment and capacity building of community health workers, designing nutrition education programmes and promoting mothers to attend mothers support groups.

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## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

## CONTRIBUTIONS

MM participated in conceptualization of the study and data collection. SIS and JK participated in conceptualization of the study and provided technical guidance and supervision throughout the study process. All authors edited the manuscript and approved the final version before submission.

## ORCID

Mildred Maingi  <https://orcid.org/0000-0002-1824-7269>

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