



Research Article

Exclusive Breastfeeding Interruption in a Comprehensive Support Setting in Western Kenya: Secondary Analysis of PROSYNK Study Data

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Abstract

Background: Exclusive breastfeeding (EBF) is defined as feeding babies with only breast milk and no other foods or liquids before the age of 6 months except for medications and vitamin and mineral supplements. In a setting with intensive support for mothers, we documented the frequency of EBF, the reasons for interruption and evaluated factors associated with interruption of EBF.

Methods: We conducted a secondary analysis of a random sample of 366 infants from a trial of pro/synbiotics administration to improve gut health and reduce systemic inflammation in infants in Homa Bay County, western Kenya (PROSYNK). Socio-demographic and anthropometric data were obtained and when and why interruption of EBF occurred were abstracted from participant's files. Chi-square and Fisher's exact tests compared categorical variables and bivariate and multivariate analysis investigated associations.

Results: EBF was interrupted in 165/366 (45.1%) infants. Overall, perception that breast milk was not enough for the baby was the major reason for interruption (83; 50.3%). The reasons for EBF interruption differed according to timing; early interruption (in the first 3 months) was mostly due to mother returning to school (48%, 23/48) while late interruption (3-5 months) was mostly due to perception that breastmilk was not enough (53%, 62/117). Interrupted EBF was associated with mothers who were younger ($p=0.01$), single ($p<0.01$) and with fewer children ($p<0.04$).

Conclusion: Interruption of EBF was common despite intensive support for mothers. Support to younger mothers, especially those who are unmarried and still attending school, and reassurance that breast milk is sufficient for infant's needs should be prioritized.

Keywords: Infants; Interruption of exclusive breastfeeding; Comprehensive support

Introduction

Globally, there has been a call for healthcare workers, lactating mothers, and their support systems to support initiation (within 1 hour) and maintenance of exclusive breastfeeding (EBF) for at least 6 months and thereafter introduction of appropriate complementary feeding [1]. Breastfeeding is a low-cost intervention with numerous benefits to both mother and baby. Optimal breastfeeding reduces infection-related deaths in young infants [11] saving the lives of about 800,000 children [1]. EBF up to 6 months versus EBF for 3-4 months followed by mixed breastfeeding lowers the risk of gastrointestinal infection for the baby, increases maternal weight loss after birth, and delays the return of menstrual periods [12]. Breastfeeding is also critically important for the prevention of stunting and promoting neuromotor development [6-8]. The benefits of breastfeeding go beyond the health sector since families save money otherwise used to buy breastmilk substitutes [9]. Breastfeeding aligns with the 2030 agenda for sustainable development under the goals of good health and wellbeing (SDG 3) and responsible consumption and production (SDG 12).

Despite progress by many countries in achieving the WHO target of 50% infants EBF by the year 2025 [1], there is great variation between settings due to differences in socio-demographic, cultural and religious factors [2]. Kenya ascribes to treaties that uphold EBF for six months and also regulates the marketing and distribution of breast milk substitutes [10]. Following the creation of legal and policy frameworks, breastfeeding rates have improved from 32% in 2008 to 60% in 2022 [3]. Child mortality has fallen during this period which can be partly attributed to increased breastfeeding.

Factors associated with maintenance of EBF include older maternal age, higher level of maternal education, higher family income, married mother, previous experience of breastfeeding (more children), vaginal delivery, and non-smoking [13,14]. Further, Alzaheb [15] found that in addition to factors above and particularly influencing initiation were rooming-in and prelacteal feeding. However, there is a paucity of data on the frequency of EBF and reasons for interruption in deprived communities provided with comprehensive support for new mothers regarding breastfeeding and healthy child-care practices. Gaining understanding of how this support performs is important for the development of programmes to promote breastfeeding.

We performed a secondary analysis of data from infants participating in a trial of pro/synbiotic administration (PROSYNK) [16]. The trial used peer mothers who had been proven to be

effective in delivering breastfeeding messages to improve post-discharge survival and growth of low birthweight infants [17].

Methods

The protocol for the PROSYNK study has been published previously [16].

Study Setting

The study was conducted in Homa-Bay County on the eastern shore of Lake Victoria in western Kenya. The county has a population of 1,131,950 [18] and covers an area of 3,154.7km². The population density is 359 people/km² with 262,036 households and an average of 4.3 members per household. The county has 8 sub-counties with 206 health facilities [19]. The main economic activities are subsistence farming, fishing, and small-scale trading. Most of the county's population lives in deprivation and malnutrition is prevalent [3]. With a score of 0.46 on the Human Development Index (HDI), the county ranks below average in most socio-economic indicators. The population is rapidly growing; the fertility rate of 5.2 children per woman is higher than the national average of 4.6 children per woman [18]. The rate of EBF in the county is 38.4% [4].

The recruitment site was Homa-Bay County Teaching and Referral Hospital, with an average of 300 deliveries per month. This referral facility receives clients from the 8 sub-counties and from neighboring counties.

Study Design

This is a secondary analysis of data from a 4-arm, open label, individually randomized, controlled, phase-2, study of a probiotic and two synbiotics to improve gut health and reduce systemic inflammation [16].

Study Population

Six hundred newborns were recruited to PROSYNK between October 2020 to January 2022. Eligible newborns were singletons with a birthweight (BW) or current weight (if BW not known) ³2000 g, who were well and had taken at least one breast feed well, lived within the catchment area and informed consent had been secured from the mother/carer. STATA 16.1 was used to get a random sample of participant's files with complete follow-up data up to 12 months. Consideration to ensure equal distribution in the four arms of the PROSYNK study (aiming at 91 in each study arm).

Study procedures

Newborns had been randomly allocated, stratified by maternal HIV status, 1:1:1:1 to three intervention arms and one control arm. All mothers/carers were visited daily for the first 10 days of life and thereafter weekly until infants were 6 months old for

pro/synbiotic administration. During home visits, communication of healthy infant-care practices including support for maintenance of EBF was provided. Infants in the control arm received the same visits as those in the intervention arm but without administration of pro/synbiotics.

Socio-demographic (maternal age, marital status, parity, mode of delivery, residence, maternal HIV status and reported smoking) and information on feeding including reasons for EBF interruption were collected by questionnaire at enrolment and during home visits at 6 weeks, 3 months, and 12 months. Anthropometric measurements were conducted at the same time points. Interrupted EBF was defined as the introduction of any fluid or food other than breastmilk at any point during the six months of close monitoring. Interruption of EBF occurring during 0-2 months was classified as “early” and occurring between 3-5 months as “late”.

Data reliability and validity

Use of standardized questionnaires, trained personnel, randomization to facilitate equal distribution of potential confounders, verification of data using source documents and consistency checks and feedback loops to address issues raised during the data abstraction process as detailed in a data management plan maximized data quality. In addition, inter-rater reliability regarding the assigned cause of interrupted EBF was performed by the principal investigator by sampling 10% of each data abstractor's files for re-abstraction. A Cohen's Kappa >0.65 was maintained for all files evaluated.

Data Analysis

Categorical variables were summarized according to absolute frequencies and percentages of subjects.

Association of potential categorical predictors of interrupted EBF (e.g. baseline socio-demographic factors) for both mother and infant were evaluated by Chi-square or Fisher's exact tests. Binary logistic regression was used to generate unadjusted odds ratios for factors with significant differential distribution at $\alpha < 0.05$. Additionally, multivariable logistic regression was used

to generate adjusted odds ratios and 95% confidence intervals for variables with significant differential distribution and longer duration of breastfeeding. Lastly, confounders in the relationship between duration of breastfeeding and predictors of breastfeeding interruption were assessed. STATA 16.1 was used for data analysis.

Sample Size Determination

Using Cochran's sample size formula and assuming that the proportion EBF for the first six months of life was 60% [3] and with $P=0.05$ and a 5% margin of error, 366 infants were required.

Ethical Considerations

Trial participants had consented for additional research on data collected during the initial, approved study (KEMRI/SERU/CGHR/320/3917; PPB/ECCT/20/04/02/2020(085); LSTM-sponsor, 19-048). Permission to use the study data was granted by the sponsor in a letter dated 16th February 2023. Permission to conduct research was granted by Jaramogi Oginga Odinga University of Science and Technology Board of Post Graduate Studies and Ethical Review Board (ERC 35/12/23-15/07) in letters dated 2nd November 2022 and 10th January 2023 respectively. A research permit was obtained from the National Commission of Science and Technology (586326).

Analysis was limited to anonymized data with subjects identified only by their unique study number. Tablets and laptops were password protected and study documents kept in lockable cabinets. The findings of this study together with the finding of the main trial will be disseminated to stakeholders and the scientific community.

Results

Participant flow, baseline characteristics and level of EBF interruption

A total of 534/600 (89.0%) participants recruited in the PROSYNK study had complete follow up data to 12 months from whom 366 (61.0% of the total study cohort) were randomly selected to be included in this study (Figure 1).

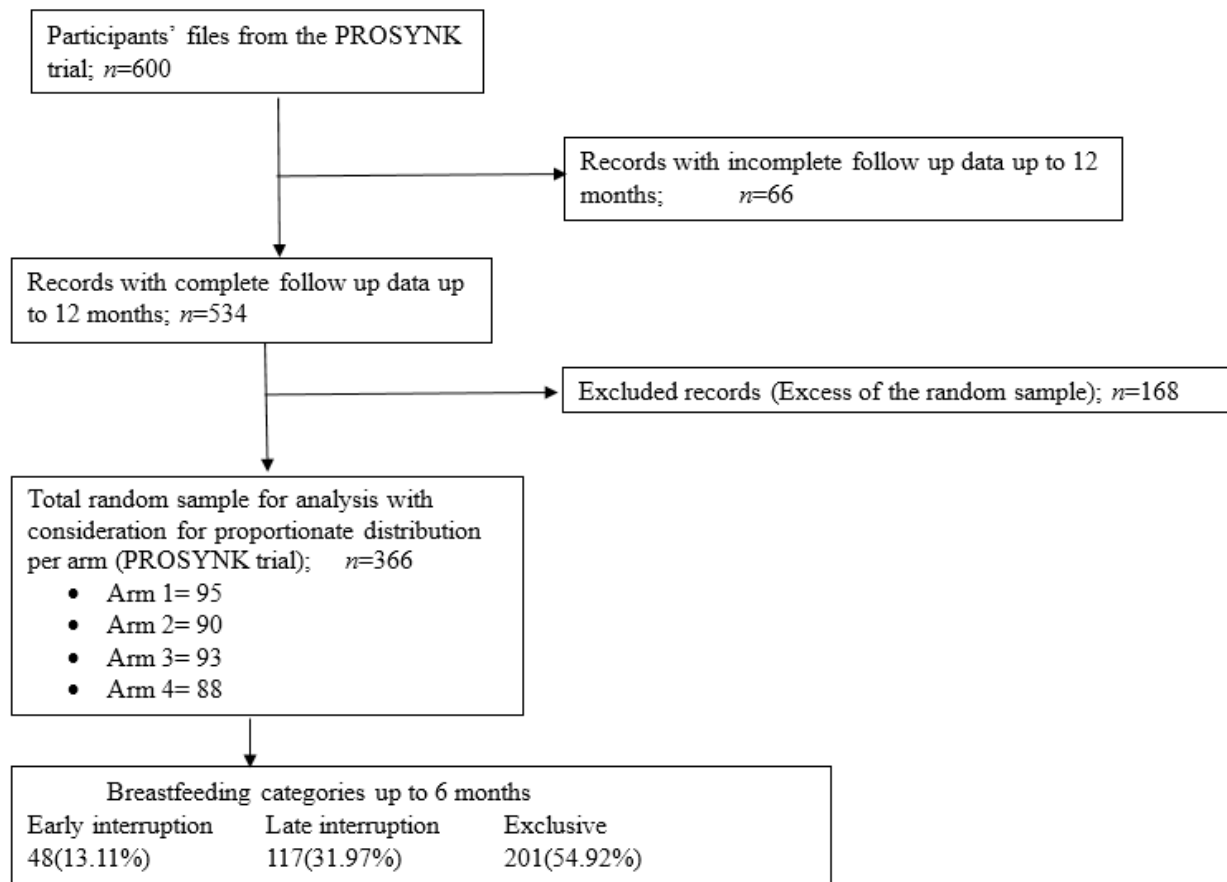


Figure 1: STROBE Flow diagram [20]

Overall, most mothers were aged between 15-35 years, were married, resided in rural areas, and had a vaginal delivery (Table 1). About half of mothers had 3 or more children. There were 199 (54.4%) female and 167 male (45.6%) infants. The proportion of infants exposed to HIV (63; 17.2%) was similar to that of the whole PROSYNK study cohort (data not shown).

EBF interruption occurred in 45.1% (95% CI: 0.40-0.50) infants. Among those infants who had interrupted breastfeeding,

majority of them 70.91% (95% CI: 0.63-0.78) were breastfed for longer (between 3-6 months), while less than one third of infants 29.09%, (95% CI: 0.22-0.37) interruption occurred early (within 3 months). Proportion of male and female infants in the interrupted EBF categories appeared not to be different from the total proportion. Mothers who interrupted EBF were younger and those who interrupted EBF early (within 3 months) had only one child (Table 1).

Characteristic	Overall (N=366)	EBF (N=201)	Interrupted EBF (N=165)	<i>p</i> - value; EBF vs. interrupted EBF	Early interruption of EBF (N=48)	Late interruption of EBF (N=117)	<i>p</i> - value; early vs. late interruption of EBF
	n (%)	n (%)	n (%)		n (%)	n (%)	
Maternal age (years)							
<15	10 (2.7)	2 (1.0)	8 (4.8)	0.01	6 (12.5)	2 (1.7)	0.01
15-24	166 (45.4)	80 (39.8)	86 (52.1)		27 (56.2)	59 (50.4)	
25-35	171 (46.7)	108 (53.7)	63 (38.2)		12 (25.0)	51 (43.6)	
>35	19 (5.2)	11 (5.5)	8 (4.8)		3 (6.2)	5 (4.3)	
Number of children							
1	99 (27.0)	31 (15.4)	68 (41.2)	<0.01	27 (56.2)	41 (35.0)	0.04
2	79 (21.6)	52 (25.9)	27 (16.4)		6 (12.5)	21 (17.9)	
≥3	188 (51.4)	118 (58.7)	70 (42.4)		15 (31.2)	55 (47.0)	
Marital status							
Single	71 (19.4)	16 (8.0)	55 (33.3)	<0.01	28 (58.3)	27 (23.1)	<0.01
Married	288 (78.7)	181 (90.0)	107 (64.8)		20 (41.7)	87 (74.4)	
Separated/divorced	5 (1.4)	3 (1.5)	2 (1.2)		0 (0.0)	2 (1.7)	
Widowed	2 (0.5)	1 (0.5)	1 (0.6)		0 (0.0)	1 (0.9)	
Residence							
Rural	237 (64.8)	129 (64.2)	108 (65.5)	0.87	33 (68.8)	75 (64.1)	0.81
Peri-urban	104 (28.4)	57 (28.4)	47 (28.5)		12 (25.0)	35 (29.9)	
Urban	25 (6.8)	15(7.4)	10 (6)		3 (6.2)	7 (6.0)	
Mode of delivery							
Vaginal	351 (95.9)	193 (96.0)	158 (95.8)	0.90	46 (95.8)	112 (95.7)	1.0
Cesarean Section	15 (4.1)	8 (4.0)	7 (4.2)		2 (4.2)	5 (4.3)	
Sex of child							
Male	167 (45.6)	90 (44.8)	77 (46.7)	0.72	18 (37.5)	59 (50.4)	0.13
Female	199 (54.4)	111 (55.2)	88 (53.3)		30 (62.5)	58 (49.6)	
HIV Exposure							
Exposed	63 (17.2)	38 (18.9)	25 (15.2)	0.34	8 (16.7)	17 (14.5)	0.73
Non-Exposed	303 (82.8)	163 (81.1)	140 (84.8)		40 (83.3)	100 (85.5)	
Study arm in PROSYNK trial							
Arm 1	95 (26.0)	57 (28.4)	38 (23.0)	0.32	11 (22.9)	27 (23.1)	0.62
Arm 2	90 (24.6)	47 (23.4)	43 (26.1)		13 (27.1)	30 (25.6)	
Arm 3	93 (25.4)	45 (22.4)	48 (29.1)		11 (22.9)	37 (31.6)	
Control	88 (24.0)	52 (25.9)	36 (21.8)		13 (27.1)	23 (19.7)	
Note: N is the total in each category, n is the number of characteristics in the category and (%) is the proportion of the characteristics in the category. EBF = exclusive breastfeeding. *Chi-squared or Fisher's Exact test.							

Table 1: Baseline characteristics/predictors of EBF of mother and infants according to EBF interruption category.

Predictors of EBF interruption

Maternal age at enrolment was not normally distributed, the overall median age was 25 years, the youngest mother was 12 years and the oldest was 43 years. Factors/baseline characteristics that were associated with EBF interruption in a similar fashion were also associated with duration of EBF (early vs late interruption). They included maternal age ($p=0.01$), marital status ($p<0.01$), and number of children ($p=0.01$), as shown in Table 1 above.

The infant baseline and socio-demographic characteristics evaluated; none was significantly associated with breastfeeding interruption (Table 1). Using the enter method, factors associated

with EBF interruption by Chi square cut off 0.05 were included in a multivariable logistic regression model assessing for factors associated with longer breastfeeding duration. Based on the likelihood ratio test, the model containing all predictors was significant relative to null model [LR X2 (4) = 16.6, $P=0.002$]. In the univariate analyses, advancing maternal age (OR=1.1), higher number of children (OR=2.4) and being in a union (OR=4.1) were significantly associated with longer breastfeeding durations. Holding other factors constant, the odds of breastfeeding for longer was 4.7 (95% CI: 1.1, 14) times for women in a union as compared to women in non-unions (Table 2).

Independent variables	Late interruption n=117(%) median maternal age	Crude Odds Ratio (95%CI)	P-value	Adjusted Odds Ratio (95%CI)	p - value
Parity					
1	41 (60%)	[Ref]			
2	21 (78%)	2.3 (0.82-6.45)	0.11	1.32 (0.41-4.20)	0.64
3 and above	55 (79%)	2.4 (1.14-5.11)	0.021	0.7 (0.17-2.60)	0.55
Marital status					
Non-union ^a	30 (52%)	[Ref]			
Union	87 (81%)	4.1 (2.0-8.2)	<0.001	4.7 (1.6-13.9)	0.005
Mother's age at enrolment (yrs.) median (range)	24 (12-43)	1.1 (1.0-1.13)	0.014	1.0 (0.93-1.11)	0.75
Note: Late interruption as the response variable. CI = confidence interval. Ref= Reference category. ^a Due to few numbers in the separated/divorced and widowed categories, these were merged with mothers who were single.					

Table 2: Odds ratios (crude and adjusted) for predictors of longer breastfeeding duration.

Reasons for EBF interruption

The reasons for EBF interruption were missing in 4/165 (2.4%) of participant's files. Overall, the most common reason reported for EBF interruption was the feeling that breast milk was not enough to meet child's nutritional needs (50.3% of lactating mothers; Table 3). School resumption was the second most common reason (26.1%), while resumption of work was reported as the third common reason (11.5%). Maternal illness and perceived child's sudden refusal to breastfeed were less common reasons for EBF interruption.

Reasons for EBF interruption differed according to the timing of EBF interruption. Early interruption was mostly due to school resumption (47.9%) and this was the only reason that was significantly different between early and late interruption ($P<0.001$). Late interruption was mostly due to perception of breastmilk was not enough to meet growing baby's feeding needs (52.9%; Table 3).

Reasons	Total interruption N=165 n (%)	Early interruption N=48 n (%)	Late interruption N=117 n (%)	<i>p</i> – value*
Perception that breast milk is not enough to meet baby’s feeding needs	83 (50.3)	21 (43.8)	62 (52.9)	0.37
School resumption	43 (26.0)	23 (47.9)	20 (17.1)	<0.001
Resumption of work/livelihood	19 (11.5)	3 (6.3)	16 (13.7)	0.28
Maternal illness	8 (4.9)	1 (2.1)	7 (6.0)	0.44
Child’s sudden refusal to breastfeed	6 (3.6)	0 (0.0)	6 (5.1)	0.18
Child illness (e.g. malnutrition requiring therapeutic feeds)	2 (1.2)	0 (0.0)	2 (1.2)	1.00
Missing reason	4 (2.4)	0 (0.0)	4 (3.4)	0.33

Note: N is the total in each category, n is the number of characteristics in the category and (%) is the proportion of the characteristics in the category.
*Chi-squared or Fisher’s Exact test

Table 3: Reasons for EBF interruption

Discussion

This study aimed to documented level of EBF, reasons for interruption and evaluate factors associated with interruption of EBF in a setting with comprehensive support in western, Kenya. There was improved level of EBF with comprehensive support for initiation and maintenance, higher than the reported baseline rate of 38.4% in Homa Bay county [4]. The level of exclusive breastfeeding was at 55% in this comprehensive EBF support setting compared to national average of 60% [3]. Both levels are well above the WHO target of 50% by the year 2025 [1]. This finding is consistent with a systematic review of 24 trials on educational programs for breastfeeding self-efficacy which showed breastfeeding educational interventions improved breastfeeding rates [21]. Therefore, consistent and sufficient support for initiation and maintenance of EBF emerged as a powerful programmatic approach for breastfeeding programming. Pragmatically, application of consistent and sufficient support for initiation and maintenance of EBF in the Kenyan context would mean designing a breastfeeding evaluation tool for implementation by health promoters to be incorporated in their routine household visits.

Overall, the most common reason for EBF interruption was due to the mother’s feeling that breast milk was not enough to meet child’s nutritional needs accounting for half 50.3% (83/165) of the reported reasons for interrupting breastfeeding. Reasons for EBF interruption differed according to the timing of EBF interruption. Those who had early interruption were mostly due to school resumption (48%, 23/48), while those who had late interruption

were mostly due to perception of breastmilk being insufficient to meet the growing baby’s feeding needs (53%, 62/117). Consistent with findings from a systematic review of barriers and facilitators of EBF in sub-Saharan Africa countries [22], EBF interruption is mostly due to lactating mothers’ feeling that breastmilk is insufficient to meet the growing child’s nutritional needs. In Homa Bay county there exists high knowledge and attitude on breastfeeding but low uptake of the lifesaving intervention [4]. Efforts directed towards supporting lactating mothers should be compassionate encouraging them to sustain the act throughout the recommended period of 6 months for EBF. Coupled with effective breastfeeding support infrastructure at workplaces, these should address needs of older women who interrupt breastfeeding post resumption of work [23].

Mothers who were younger (median age 18 years) were more likely to interrupt breastfeeding early due to resumption of school. Congruent with other studies, interruption of breastfeeding occurs commonly in adolescents since the current support structures do not meet their unique needs [24]. In Kenya, according to Kenya Demographic and Health Survey (KDHS) 2022 there was a decline in teenage pregnancy rates from 18% in 2014 to 15% in 2022 [3]. The household survey report also highlighted that poverty and lack of education were drivers of the high number of teen pregnancies. In Homa Bay county where the Human Development Index (HDI) is 0.46, poverty is rampant and teenage pregnancy is high [18] and is expected to remain high. Consequently, the county and national governments should make considerable investment to ensure public health facilities are adolescent and youth friendly and where

support for breastfeeding is afforded to younger mothers.

Factors that were associated with EBF interruption were younger maternal age (including mothers who were still in school), not being in a union, and smaller families (perhaps with less previous experience of breastfeeding). Similarly, these factors were also associated with longer duration of EBF. Consistent with previous findings, the practice of breastfeeding is influenced by several factors such as antenatal care, religious and cultural practices and most commonly socio-demographic factors [13,14]. Further, the unique and complex relationship of these factors were explored and being in a union was the only factor associated with longer breastfeeding duration in the final model containing the above favorable predictors of longer EBF duration. However, this relationship is complex since the older a woman is, the more likely she is married and will have more children. Therefore, closer examination of more predictors of breastfeeding is warranted for complete understanding of how the factors interrelate. This observation notwithstanding, being in a union in economic terms could have meant that mothers were provided with enough to eat, were well taken care of and coupled with cultural connotation that spouses needed to be close post-delivery to provide emotional support [22] could have led to longer durations of EBF. Furthermore, breastfeeding requires collaborative efforts by healthcare workers, lactating mothers, and their support systems to be able to mitigate against negative influences for the practice [1].

Conclusion and Recommendations

The findings confirm that consistent and sufficient support for initiation and maintenance of EBF serve to increase EBF rates. Surprisingly, even with the robustness of support, the rates were still lower than the national rates. As a child grows older, mothers become more concerned of whether breastmilk alone is enough for the child and hence the reason for late interruption of EBF. The majority of younger mothers were attending school and interruption was because of resumption of studies. Meanwhile, being a young mother, single and with fewer number of children emerged as predictors of EBF interruption. Notably, the combined effect of the predictors was not fully understood since the older a mother is the more likely she is married and could be having many children.

Consistent and sufficient support to lactating mothers for EBF initiation and maintenance by healthcare providers in health facilities and in the communities are needed. WHO/UNICEF Ten steps for successful breastfeeding need to be implemented in all settings as from antenatal visits in Mother Child Health clinics (MCH) through the peripartum period for initiation in hospital delivery units and post-partum period for maintenance of breastfeeding in MCH clinics as mothers bring their babies for vaccination and in community settings through delivery of

community health package by health promoters. Educational support to expectant mothers and lactating mothers should be revamped in health facilities by healthcare workers and in the community by health promoters to demystify the perception that breast milk is not enough to meet the growing child's nutritional needs. Greater support for younger mothers, especially those who are unmarried and still attending school needs to be prioritized through provision of health services in youth friendly centers. Promoting and supporting appropriate breastfeeding practices is an essential strategy to prevent growth faltering which is a precursor of stunting and reduce child morbidity and mortality.

Disclosure

Author Contributions

Conceptualization, Micah J. June; methodology, Micah J. June, Mary I. Otiti and Daniel O. Onguru; formal analysis, Micah J. June and Alloys K'Oloo; writing—original draft preparation, Micah J. June; writing—review and editing, Angucia Bridget S, Mary I. Otiti, Stephen Allen and Daniel O. Onguru. Supervision by Fred A. Amimo.

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Data Availability Statement

Data supporting the study results can be provided followed by request sent to the corresponding author's e-mail. Approval to access the data will be granted only if the request is approved by all of the investigators.

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