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Examination of key determinants of successful breastfeeding practices in Bihar, India

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Master of Arts in Bioethics
Case Western Reserve University
2014

Thesis Committee Chair: Melissa Fox Young, PhD

An abstract of
A thesis submitted to the Faculty of the
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Abstract

Examination of key determinants of successful breastfeeding practices in Bihar, India
By Nivedhitha G. Meyyazhagan

Introduction: Scaling breastfeeding practices up globally could prevent over 823,000 annual deaths in children younger than 5 years. Care India's Integrated Family Health Initiative (IFHI) focuses efforts on maternal and child health issues related to child nutrition including delivering services to encourage successful breastfeeding practices in Bihar, India.

Objective: The objectives were to 1) examine current early initiation of breastfeeding and exclusive breastfeeding practices in Bihar, India among 0-5 month infants; 2) identify key determinants of successful early initiation of breastfeeding and exclusive breastfeeding practices; 3) identify gaps, barriers and opportunities to desired breastfeeding practices within rural communities to improve IYCF programming in the future.

Methods: This study is a cross-sectional, secondary data analysis of existing CARE India monitoring data (n=31, 374) to analyze the key determinants of successful breastfeeding practices among in Bihar.

Results: Early initiation of breastfeeding was 53% among 0-2 months and exclusive breastfeeding was 66% and 46% for 0-2 months and 3-5 months, respectively. Key sociodemographic factors including maternal age, caste, SES, and education were associated with the success of breastfeeding. Early initiation of breastfeeding was strongly associated with exclusive breastfeeding among 0-2 month olds [OR=1.56, 95% CI (1.45, 1.69)]. Furthermore, mothers who were visited by a frontline worker (FLW) postpartum and were given breastfeeding advice were more likely to exclusively breastfeed.

Discussion: Breastfeeding counseling from community FLWs can increase early initiation and exclusive breastfeeding for women in a large scale program in Bihar. However, the success of this program is limited by the reach of FLWs and underlying sociodemographic factors.

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I must express my very profound gratitude to my parents, my sister and brother-in-law, and as well as the rest of my loving family for their continuous support and unwavering confidence in me. A special love for my fiancé, Vinai, who has been my pillar of strength for the last two years at Emory and every phase of my thesis. Lastly, my puppy, Terabyte, who has stayed by my side and kept me company throughout my entire writing process.

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INTRODUCTION

The overall disease burden resulting from child undernutrition continues to impact populations all over the world. In the developing world, malnutrition in infants and young children is one of the most striking problems with over 150 million children affected by malnutrition and over half of those living in South Asia (Unicef, 2015). Additionally, stunting, severe wasting, and intrauterine growth restriction combined is responsible for over 2.2 million deaths and 21% of disability-adjusted life years (DALYs) for children younger than 5 years of age (Black, et al., 2008).

By scaling up of breastfeeding universally could prevent over 823,000 annual deaths in children younger than 5 years and 20,000 annual deaths from breast cancer (Victora, et.al, 2016). In both rich and poor countries alike, breastfeeding promotion can contribute to short-term and long-term outcomes. With that being said, child undernutrition is one of the most catastrophic, yet preventable, global health issues that has stricken populations across the globe.

Ananya Program: CARE India's Integrated Family Health Initiative

Despite efforts to improve health indicators, the global burden of maternal and child undernutrition is still surprisingly high. To address this burden, the Ananya program was created by the Bill and Melinda Gates Foundation to address health challenges in Bihar as a five-year program (2011-2015). CARE leads the Integrated Family Health Initiative (IFHI) with Ananya for scaling up family health services in Bihar. CARE India's IFHI has been working in conjunction with the Government of Bihar since 2010 to tackle prevalent maternal and child health (MCH) problems with Emory University supporting nutrition improvement goals by implementing a package of interventions in eight districts of Bihar.

Though IFHI efforts are an attempt to tackle these multiple maternal and child health issues, infant and young child feeding is still one of the most challenging tasks to tackle, with regards to child health. Specifically, this partnership is supporting the Government of Bihar in "designing, testing, and scaling up solutions to increase the availability, quality and coverage of priority, cost-effective interventions in maternal, newborn and child health; immunization; nutrition; and family planning." (Ananya, 2015).

IFHI is focusing efforts on MCH issues related to child nutrition through health sub-center (HSC) trainings for frontline workers (FLWs), integrating services across the "1,000 days window of opportunity", optimization of financial and non-financial incentives, and improving resources and knowledge of FLWs across Bihar (Ananya, 2015). Poor nutrition during these first 1,000 days of a child's life can lead to stunted growth, which is irreversible with delays in cognitive ability and academic performance (Unicef, 2015). Though the relation between exclusive breastfeeding and continued breastfeeding has been established, there is limited research on the determinants of successful feeding practices and the translation of early initiation of breastfeeding to exclusive breastfeeding in the Bihar context.

This study aimed to obtain a comprehensive understanding of current breastfeeding practices in Bihar, India and identify the key determinants of successful breastfeeding practice among children 0-5 months of age. The specific focus of this proposed study is to identify determinants of successful breastfeeding practices among 0-5 month children in Bihar. Being greatly challenged by poor infant and young child feeding practices, Bihar needs optimal services at both the health sub-center and community level.

Based on recent epidemiological and biological findings, the expansion of the known benefits of breastfeeding for women and young children is crucial for progress in this field of

maternal and child nutrition. By understanding what factors are influencing successful breastfeeding practices, we will be able to assess programmatic changes necessary to improve overall child nutrition in Bihar, India. The results will assist CARE India in revising training materials to frontline health workers and programs in communities to improve counseling provided for new or expectant mothers in Bihar.

Research Question

What are key determinants of successful breastfeeding practices in rural Bihar, India among infants 0-5 months of age?

Thesis Objectives

1. To examine current early initiation of breastfeeding and exclusive breastfeeding practices in Bihar, India among 0-5 month infants.
2. To identify key determinants of successful early initiation of breastfeeding and exclusive breastfeeding practices.
3. To identify gaps, barriers and opportunities to desired breastfeeding practices within rural communities to improve IYCF programming in the future.

BACKGROUND

The World Health Organization (WHO) has defined the following indicators of feeding practices of infants and young children: early initiation of breastfeeding and exclusive breastfeeding under 6 months (Victora, et.al, 2016). Early initiation of breastfeeding is defined as the proportion of children born in the past 24 months who were put to the breast within an hour of birth and exclusive breastfeeding is the proportion of infants aged 0-5 months who are fed exclusively with breast milk (Victora, et al., 2016).

During pregnancy and up to 24 months, consumption of vital nutrients improves health later in life which is a crucial component for addressing undernutrition among infants and young children (IIPS, 2007). This period of time of is often referred to as the "first 1,000 days window of opportunity". Breastfeeding contributes to the overall well-being and health of the mother and promotes sensory and cognitive development while protecting infant against infectious and chronic diseases (WHO, 2015).

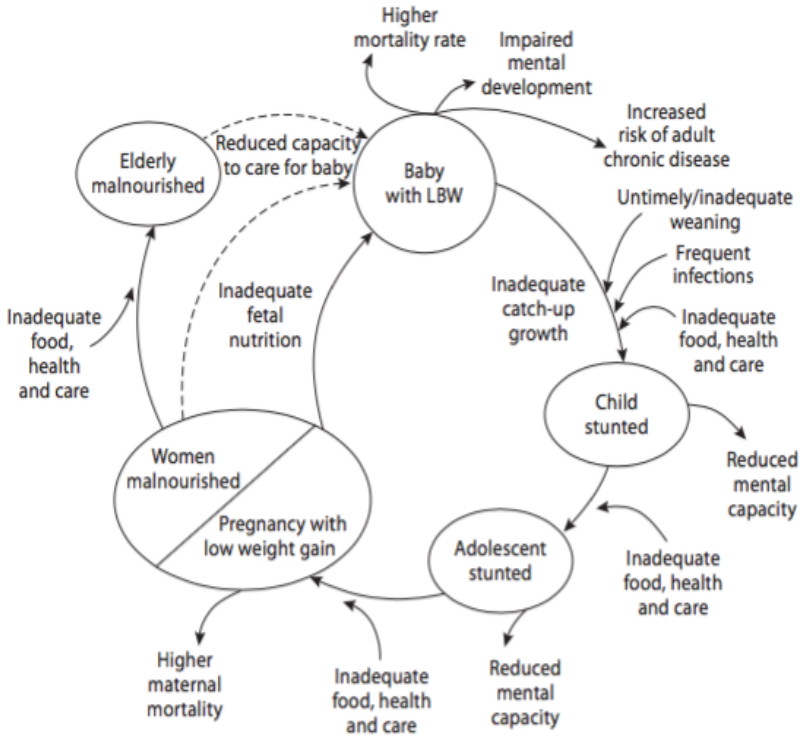
The WHO and UNICEF recommend early initiation of breastfeeding within 1 hour of birth, exclusive breastfeeding for the first six months of life and complementary feeding should begin at 6 months of age along with continued breastfeeding up to 2 years of age or beyond (WHO, 2015). Complementary feeding is the introduction of nutritionally-adequate and safe (solid) foods at 6 months with continued breastfeeding. This is because breast milk is not sufficient alone to provide all the nutrients that a child requires for adequate development.

Global burden of malnutrition

Malnutrition has presented considerable threats to human health globally including both undernutrition and overweight (WHO, 2015). The challenges that inadequate nutrition has created is making it very difficult to treat in low-resource settings and overburdened communities. The

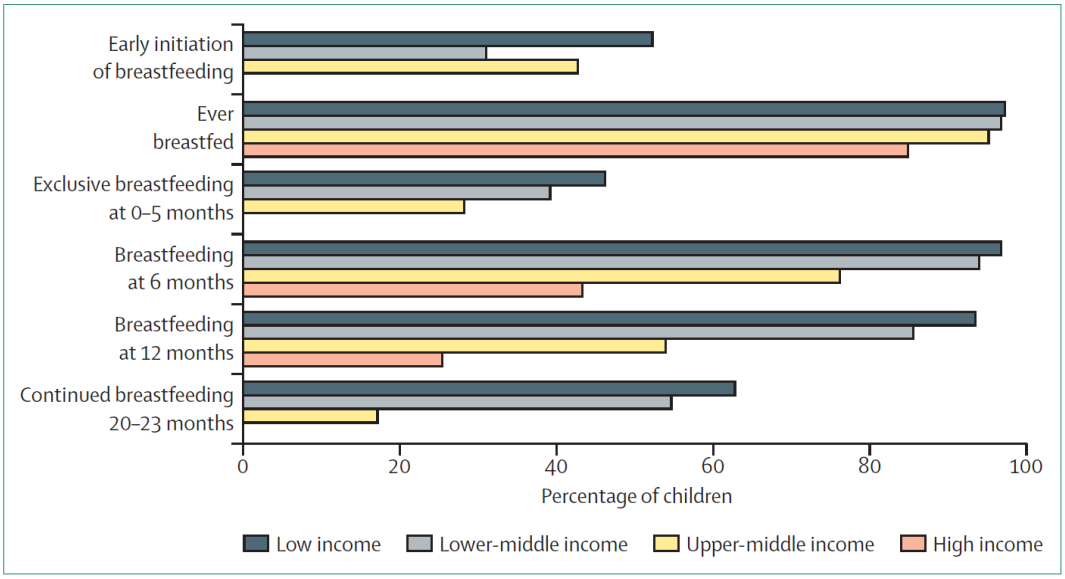
World Health Organization (WHO) describes stunting as "failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions," or low height-for-age and wasting as low weight-for-height associated with acute starvation, severe disease or a chronic unfavorable condition (WHO, 2015). Good nutrition throughout the life cycle indicates increased growth and development; however, risk of low-birth weight (LBW), stunting, and risk of adult onset diseases is increased with poor nutrition. Figure 1.5 demonstrates the cyclical model of importance for good nutrition throughout the lifecycle from nutrient intake, health care and nutrition education. The effects of poor nutrition not only impact the infant during and right after pregnancy but also creates lasting effects through adulthood and future generations.

Figure 1.5 Nutrition through the life cycle showing effects of LBW, stunting and risk of adult onset diseases. (Ahmed, et al., 2012).



Infant and young child feeding is extremely important for child health and overall survival (Cai, et al., 2012). Improving infant and child nutrition has the potential to alter health outcomes if addressed early enough. Figure 1.1 presents various breastfeeding indicators by country income group in 2010 from national survey data for up to 153 countries of children under two (Victora, et al, 2016). Globally, except for early initiation, prevalence of all indicators decreased with increased national wealth but low income countries had a higher prevalence of breastfeeding across ages (Victora, et al., 2016).

Figure 1.1 Breastfeeding indicators by country income group in 2010 from national survey data using standard indicators and weighted by national populations of children under 2 years. Includes data for up to 153 countries (Victora, et al., 2016).

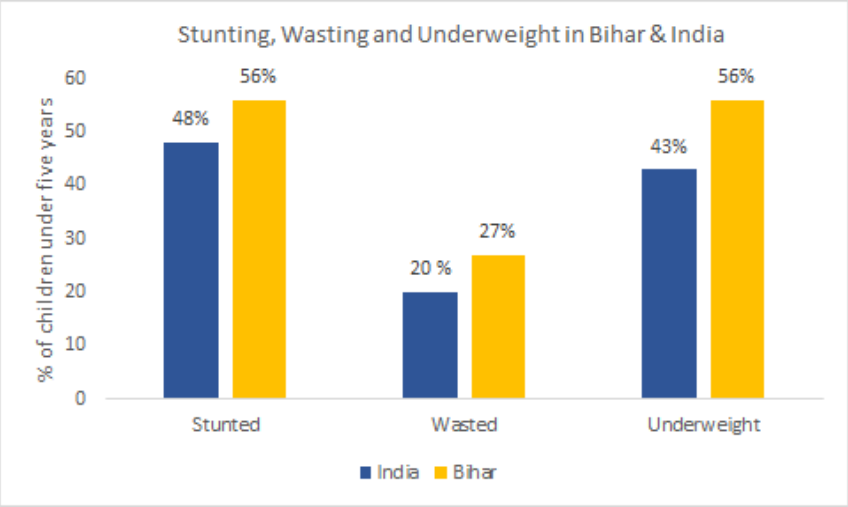


India

The concentration of child undernutrition is highest in South Asia, with almost 50% of the world's undernourished children living in this region (Black, et al., 2008). More specifically, almost half of the children in India under the age of 5 years are chronically stunted and face

malnutrition throughout all stages of the life cycle (IIPS, 2007) (Figure 1.2). The National Family Health Survey (2005-2006) in India, indicated that there is a strong inverse relationship between undernutrition in children and the level of wealth of the households they live in and that even in the wealthiest households, almost 25% of children are stunted and 20% are underweight (IIPS, 2007).

Figure 1.2: Percentage of children under age five that are stunted, wasted and underweight in India and Bihar (IIPS, 2007).



Bihar

As one of the largest and poorest states with over 100 million people, Bihar has one of the highest rates of maternal, neonatal and infant mortality (Paintal, 2011). Undernutrition is a key challenge in Bihar, with approximately 50% of children under the age of 3 years suffering from malnutrition (Paintal, 2011). Bihar remains as one of the states with the highest rates of child malnutrition despite efforts. CARE programming attempts to tackle these rates of malnutrition in Bihar by strengthening overall Infant and Young Child Feeding (IYCF) practices, however there is still room for improvement.

Unlike the national data, Bihar has worsened since NFHS-2, wasted children increased from 25% to 33% and children who were underweight increased from 52% to 55% (IIPS, 2007). Figure 1.3 presents the initial breastfeeding practices in Bihar India from the NFHS-3 for last-born children in the five years preceding the survey (IIPS, 2007). With over 94% ever breastfeeding only 3% initiate breastfeeding within one hour of birth (IIPS, 2007). It has been noted that poor breastfeeding practices alone lead to 800,000 child deaths each year in Bihar, which accounts for almost 12% of all child deaths in the state (Aga Khan, 2015).

Figure 1.3 Initial Breastfeeding Practices in Bihar, India of children in the five years preceding NFHS 2005-2006 survey and for last-born children in the five years preceding survey (IIPS, 2007)

		Among last-born children born in the last 5 years who were ever breastfed			
		Percentage who started breastfeeding:			
	Percentage ever breastfed	Within half an hour of birth	Within one hour of birth	Within one day of birth	Percentage who received a prelacteal feed
Bihar	94.4	2.8	3.7	30.0	90.6

Around the globe

Despite, the WHO's efforts to increase global exclusive breastfeeding, it is still not widely practiced. Identifying the determinants that are associated with early cessation of exclusive breastfeeding is crucial for defining strategies to promote exclusive breastfeeding. In one prospective cohort study conducted in Southern Brazil, researchers found that factors such as adolescent mothers, fewer than six prenatal care visits, and poor latch-on were associated with

cessation of exclusive breastfeeding before six months (Cordova do Espirito Santo, et al., 2007). The researchers concluded that activities to promote exclusive breastfeeding should be reinforced and enhanced for younger mothers and encourage advice for these mothers in correct breastfeeding techniques (Cordova do Espirito Santo, et al., 2007).

In a descriptive study conducted in Pondicherry, India, to help understand whether antenatal counseling on breastfeeding and postnatal lactation support were utilized for promotion of exclusive breastfeeding, it was found that existing counseling on breastfeeding is inadequate in this population and still needs to be strengthened as a priority during antenatal visits (Dhandapany, et al., 2008). This was potentially due to a number of reasons including, lack of confidence in mothers' ability to breastfeed, problems with latching or suckling, breast pain or soreness, perceptions of insufficient milk supply, and an overwhelming lack of individualized encouragement from health care providers post-delivery (Dhandapany, et al., 2008). However, more research still needs to be done to further understand how health care providers should counsel and provide training in breastfeeding support and management (Dhandapany, et al., 2008).

To increase early and exclusive breastfeeding, researchers in rural Uttar Pradesh, conducted a formative study to determine what programmatic and behavior changes would accelerate the adoption of successful breastfeeding practices (Aruldas, et al., 2010). Their recommendations included building awareness among women and family members and incorporating an appropriate mix of media to support and strengthen the role of the frontline workers (Aruldas, et al., 2010). Though there has been a significant amount of research on breastfeeding practices in India, there is still limited research conducted in Bihar.

Purpose of Study

Early cessation of breastfeeding is far too common. As a pivotal time frame to create lasting change, newborns and infants between 0-5 months of age will be the focus of this thesis. Though programmatic efforts are in place to improve child nutrition, progress has been drastically slow despite the urgency of the issue.

This study will provide insights that will help inform CARE on the current practices and challenges related to breastfeeding practices among 0-5 month infants. While there is global evidence of impact in improving infant and young child nutrition, evidence for improving breastfeeding practices is lacking across India, and more specifically, in Bihar. There is a dire need for more comprehensive, formative research to examine the state of breastfeeding practices and reduce the childhood burden of malnutrition. The current state of nutrition and IYCF practices in Bihar, India, proves that it is essential to identify the barriers, gaps and determinants of successful practices to improve CARE programming and future implementation of interventions.

METHODS

Study Design

This thesis is a secondary data analysis of existing CARE India program data (n=31,374). The data used for the thesis was de-identified in June 2015 by CARE India prior to analysis and was linked to an individual respondent by a code number. The data source was CARE India Round 6 monitoring data- Lot Quality Assurance Sampling (LQAS+) surveys collected in Bihar, India and is used to continuously monitor CARE programming and to identify which factors affect successful feeding practices.

The first five rounds of LQAS focused on specific blocks and districts, yet LQAS+ Round 1 (Round 6 overall) was the first round of data collection to cover all districts. LQAS+ began in mid-2014. Analysis of LQAS+ Round 1 provides opportunities to compare estimates between IFHI districts and other 30 districts, data collection by project staff versus independent data collectors, and lastly IFHI level of support when present and when it was withdrawn.

Lot Quality Assurance Sampling (LQAS+)

The Lot Quality Assurance Sampling (LQAS) method was initially developed in the 20th century as a method for quality assurance in industrial production but has since been adopted in public health practice for rapid health assessments to monitor health programs (Lanata, Black, 1991). LQAS methodology uses small sample sizes and can be used to provide information on each lot that is sampled. More specifically, data collected is used to identify high priority areas or indicators that were not achieving the benchmark or target.

In each initial round (1-5), LQAS was used to draw a fixed sample of 19 individuals for each block from each of four groups of beneficiaries, children 0 to 2 months, 3 to 5 months, 6 to 8 months, and 9 to 11 months. In round 6, the age group of 12-23 was added, specifically for assessment of standard indicators of immunization coverage. The key advantage to the LQAS approach is that it provides information to assess the achievement of coverage target, within given levels of confidence and helps to prioritize resource allocation based for the appropriate block or district level (CARE Brief, 2015).

Study Population & Sample Size:

The populations of interest for this research study were mothers of infants 0-5 months of age. This data is coming from two separate surveys each with 15,687 survey respondents, who were mothers of 0-2 and 3-5 month infants. The mothers were chosen using the LQAS+ Survey technique which was incorporated by CARE India. This was used in a two-stage cluster random sampling in all 534 blocks and 38 districts of rural Bihar. The primary data collection was by independent Concurrent Monitoring and Learning staff and completed mid-2014. The data quality was validated by 15% spot checks and back checks.

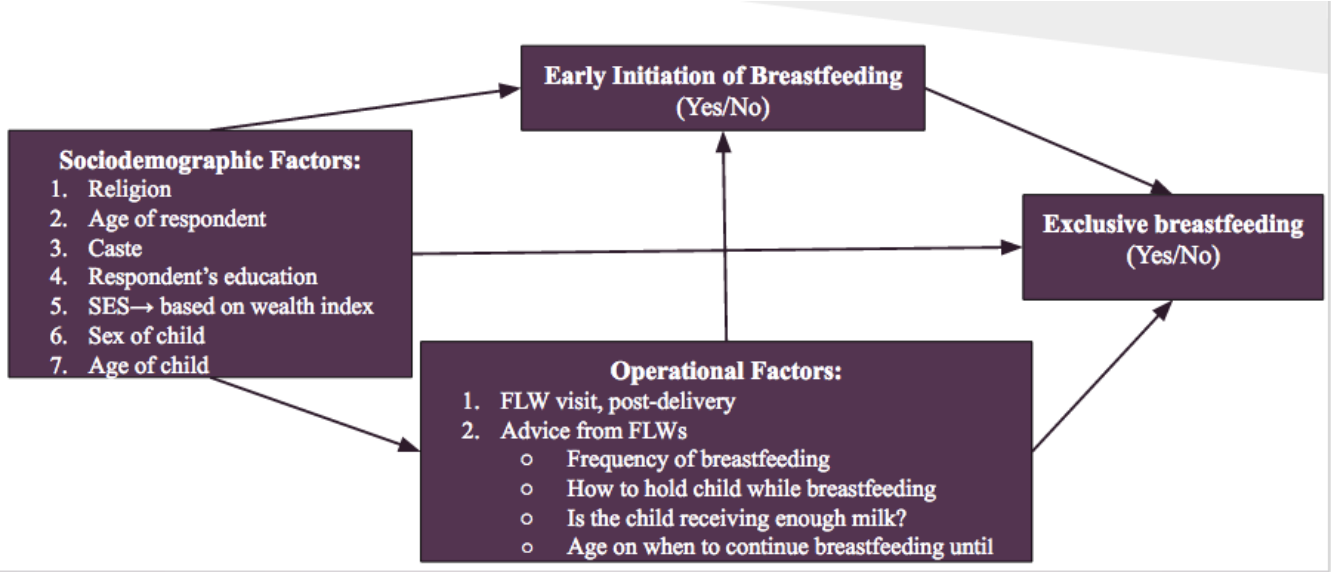
IRB Approval

The Institutional Review Board (IRB) at Emory University in Atlanta, Georgia, reviewed and waived IRB approval for this analysis because it did not constitute as human subjects

research, as defined in Emory University's policies, procedures and federal rules. As the data received from CARE India was de-identified prior to start of study and no Emory agents were involved in the collection or de-identification of these data.

Below is a conceptual framework to clearly understand the models and relationships included in this analysis. In this diagram, arrows represent which determinants are potentially affecting the exposure through association. This conceptual framework presents the multiple factors that can be potential determinants for successful breastfeeding practice.

Figure 1.4 Conceptual framework for determinants of successful breastfeeding practice among infants 0-5 months in Bihar, India.



Outcome variables

Breastfeeding practices were assessed in the 0-2 and 3-5 month dataset with predictors of successful breastfeeding outcomes included in the final analyses. Key outcome variables included:

early initiation of breastfeeding in the 0-2 month survey and exclusive breastfeeding in 0-2 months and 3-5 months.

Sociodemographic factors

The administered questionnaire collected information on maternal age, religion, caste, maternal education level, and SES etc. The sociodemographic factors in this analysis include, age of mother, religion, caste, mother's education, sex of child and age of child and SES. The age of mother was broken down into three categories 14-24 years, 25-30 years and 30-49 years. Religion was categorized between Hindus and Muslims as those were the two most predominant religions in this region. Other religions were less than 1% so were not included in models. Caste included scheduled caste/tribe, other backward classes and others. Mothers were categorized into three groups for education level attained, illiterate, literate with education up to class eight, and literate with more education than class eight. Sex of child was categorized to males or females and the age of child was broken down by month between 0-5 months. Lastly, SES was calculated based on wealth index and respondents were categorized into lower, middle and upper class.

Program operational factors

One of the key program operational factors examined was the receipt of breastfeeding advice and counseling from frontline workers. Mothers were asked about what specific advice and counseling were provided throughout the first six months post delivery. The program operational factors used in this cross-sectional analysis for 0-2 months include, being visited by any FLW in

the first week after delivery, FLW observation of breastfeeding technique, age to breastfeed until, advised on breastfeeding on demand, not to give anything other than breast milk, how to hold the child while breastfeeding, how to understand whether child is receiving enough breast milk and other problems being faced during breastfeeding affect breastfeeding practice. Given the low overall prevalence of advice, this was coded as no advice received versus any or some advice received.

The program operational factors for 3-5 months include included FLW advice focused on future complementary feeding practices at six months. This is recommended during the 3-5 month timeframe to ensure timely introduction of complementary foods at six months. Additional counseling included in 3-5 month analysis was visit by FLW post-delivery and recommended age to exclusively breastfeed until. Both of these components were considered in analysis because of potential impact on continued breastfeeding practice across age groups. The individual advice and counseling determinants of exclusive breastfeeding provide insight on what factors influence mothers to continue breastfeeding.

Complementary feeding advice included, dietary diversity, age-appropriate introduction of complementary foods, adequate frequency of foods, and minimum acceptable diet. Dietary diversity was split into three groups, according to WHO guidelines, more than or at least four food groups, less than four food groups and no advice at all. In this model, the complementary advice category was presented as no advice versus any or some advice. This was calculated first by coding advice for each advice category as a bivariate and then creating a new advice variable of ‘total

advice' which is a sum of advice provided (i.e. if advice was given on frequency of food=1, if not then =0) then categorized as receiving any or no advice, accordingly. The categories for total advice were broken down into zero for no advice received, 1-6 advice for some advice. Additionally, it should be noted that results from 3-5 advice is based on total sample instead of only those visited by FLW based on variations in skip patterns. This is a limitation noted in the discussion.

Data Analysis:

All statistical analyses were conducted using SAS 9.3 statistical analysis software. The distribution of the socio-demographic characteristics, operational factors including visits from frontline worker post-delivery, receiving advice from the FLW on proper breastfeeding practices, and receiving complementary feeding advice prior to six months were analyzed to understand all potential determinants of successful IYCF practice.

Distribution was determined by conducting descriptive analyses using survey frequency procedure to determine the unweighted frequencies and proportions, weighted proportions. Corresponding 95% confidence intervals were determined by using block population divided by 19 (as 19 subjects were selected from each of the 137 blocks) as the population weight. Weighted (using population weights) bivariate and multivariate logistic regression modeling were conducted to determine unadjusted (OR) and adjusted (each sociodemographic factor adjusted for all others or each advice/counseling service adjusted for important sociodemographic factor) odds ratio

(AOR) as the measures of association with corresponding 95% confidence intervals between study variables.

Logistic regression modeling produced results in the final analysis for early initiation and exclusive breastfeeding practice with sociodemographic factors and program operational factors. This showed predictive effects that are represented by area under the curve. Odds ratios were utilized in this study to compare the relative odds of the occurrence of the outcome of interest, in this case successful breastfeeding practice, given exposure to the variables of interest (i.e. sociodemographic factors, advice, counseling, etc.). With an odds ratio greater than 1, exposure is associated with a higher odds of outcome and less than 1 is associated with a lower odds of outcome. Multivariate logistic regression models were used to examine how breastfeeding practices are affected by key sociodemographic factors and operational factors (Figure 1.4).

Data analyses covered 0-2 and 3-5 month data sets. The analysis involves bivariate and multivariate analyses to determine unadjusted and adjusted odds ratios and 95% confidence intervals to examine determinants of child feeding practices. The key outcome variables include early initiation of breastfeeding and exclusive breastfeeding. The odds ratios are used to compare the relative odds of the occurrence of the outcome of interest, successful breastfeeding practice, given exposure to the variable of interest: sociodemographic and operational factors. Analyses will then be used to determine whether predictor variables like SES or FLW advice are key determinants of breastfeeding practice, and to compare the magnitude of these factors on the outcome of interest.

RESULTS

This section addresses the first two key objectives of this thesis. The first objective was to examine and compare current early initiation and exclusive breastfeeding practices in rural Bihar among 0-5 month infants across all 38 districts. The second objective is to identify these key determinants of successful breastfeeding practices. The last objective focuses on identifying the gaps, barriers and opportunities to desired breastfeeding practices and potentially complementary feeding practices within rural communities to improve overall CARE India IYCF programming in the future and will be presented in the discussion section.

Objective 1
To examine and compare current early initiation and exclusive breastfeeding practices in Bihar, India among 0-5 month infants.

A total of 31,374 survey respondents (15,687 per age group) were included in this analysis. Table 1 presents descriptive statistics of the survey samples, including information on child, mother, and household demographic characteristics. The majority of respondents were between 14-24 years old, fewer 25-30 years and the least 30-49 years among both age groups. Additionally, there were approximately 52% males in the 0-2 month group and 53% males in the 3-5 month group. Among the 0-2 month respondents, approximately 84% were Hindu and 16% were Muslim. Among the 3-5 month group there were similar distributions for religion. Nearly 61%, in both age groups were illiterate, 19% had schooling up to class eight and the remaining studied past class eight. The household socioeconomic status indicates that almost 33% of the households were in each of the wealth levels (poor, middle and high).

Table 1. Distribution of the individual and household characteristics of the recruited respondents, LQAS+ Round 6 data, 2010-2014, n=15,687 per age group

		0-2 MONTHS		3-5 MONTHS	
	Categories	Sample size	% (95% CI)	Sample size	% (95% CI)
Age of the respondent	14-24 years	10102	64.4 (63.5, 65.2)	10038	64.3 (63.5, 65.1)
	25-30 years	4270	27.0 (26.3, 27.8)	4469	28.2 (27.4, 29.0)
	30-49 years	1313	8.6104 (8.1209, 9.1000)	1179	7.5 (7.0, 8.0)
Religion	Hindu	13265	83.5 (82.9, 84.2)	13329	83.9 (83.2, 84.5)
	Muslim	2374	16.5 (15.8, 17.1)	2308	16.1 (15.4, 16.8)
Caste	Scheduled Caste/Tribe	4324	27.3 (26.6, 28.1)	4789	30.2 (29.4, 31.0)
	Other Backward classes	9333	59.7(58.8, 60.5)	8933	57.1 (56.3, 58.0)
	Others	2030	13.0 (12.4, 13.6)	1965	12.7 (12.1, 13.3)
Respondent's education	Illiterate	9541	60.9 (60.1, 61.7)	9462	60.3 (59.5, 61.2)
	Literate up to class VIII	2835	19.0 (18.3, 19.7)	2920	19.6 (18.9, 20.3)
	Literate more than class VIII	3264	20.1(19.4, 20.8)	3254	20.1 (19.4, 20.8)
SES	Poor	5223	32.5 (31.7, 33.3)	5248	34.0 (33.2, 34.8)
	Middle	5161	33.9 (33.1, 34.7)	5117	33.3 (32.5, 34.1)
	Upper	5303	33.6 (32.8, 34.4)	5142	32.6 (31.8, 33.4)
Sex of child	Male	8140	51.9(51.1, 52.8)	8301	53.0 (52.2, 53.9)
	Female (2)	7547	48.1 (47.2, 48.9)	7386	47.0 (46.1, 47.8)
Age of child	0 month	4934	31.3 (30.5, 32.1)	---	---
	1 month	5670	36.2 (35.4, 37.0)	---	---
	2 months	5076	32.5 (31.7, 33.3)	---	---
	3 months	---	---	5108	32.7 (31.9, 33.5)

	4 months	---	---	5292	33.5 (32.7, 34.3)
	5 months	---	---	5287	33.8 (33.0, 34.6)

Objective 2
To identify key determinants of successful early initiation and exclusive breastfeeding practices.

Table 2 presents the current distribution of breastfeeding practices in rural Bihar among 0-2 and 3-5 month infants. Early initiation of breastfeeding, defined as within one hour of child's birth, was high across Bihar with a prevalence of with 53% among 0-2 month infants. It is notable that almost 99% of 0-2 month children were currently breastfeeding and 66% were exclusively breastfeeding. In other words, they were not given anything other than breast milk, medicine or oral rehydration solution (ORS) in the last 24 hours. Among 3-5 month children, there was a very slight drop in those still currently breastfeeding from the 99% to 98% and a significant decrease in those exclusively breastfeeding from the 66% to 45%.

Table 2 Distribution of current breastfeeding practices in Bihar, India, Round 6, n=15, 687 for each age group.

		0-2 MONTHS		3-5 MONTHS	
		Sample size	% (95% CI)	Sample size	% (95% CI)
Early initiation of breastfeeding	Yes	8,273	53.5 (52.6, 54.3)	---	---
	No	7,414	46.5 (45.7, 47.4)	---	---
Exclusively breastfeeding	Yes	10,217	66.0 (65.2, 66.9)	7, 198	45.7 (44.9, 46.6)
	No	5,470	34.0 (33.1, 34.8)	8,526	54.2 (53.4, 55.1)
Currently breastfeeding	Yes	15,489	98.8 (98.6, 99.0)	15,352	97.9 (97.6, 98.1)
	No	198	1.2 (1.0, 1.4)	335	2.1 (1.9, 2.4)

0-2 month advice distribution

Table 3 presents the distribution of breastfeeding advice and counseling provided by frontline worker (ASHA/AWW/ANM) for mother of infants 0-2 months. Only 37% of the 5,674 mothers were visited by an FLW within one week of delivery, of which only about 38% received advice on breastfeeding as frequently as the child wants. Advice regarding how to properly hold the infant while breastfeeding and understand whether the infant was receiving enough milk was less than 10%. Of those visited by an FLW, only about 28% were advised not to give anything but breast milk at this age but in the overall 0-2 month sample approximately 14% was instructed on what age to exclusively breastfeed until. Additionally, only about 4% of those visited by an FLW was advised on how to understand whether the child is receiving enough breast milk. Lastly, of

the total 0-2 month sample only about 10% had an FLW observe them while breastfeeding to modify practice and ask questions if problems arose with only 20% receiving any or some advice.

Table 3 Distribution of breastfeeding advice or counseling for 0-2 months, LQAS+ Round 6 data, 2010-2014, n=15,687

	0-2 MONTHS		
	Categories	Unweighted frequency	Weighted proportion (%) & (its 95% CI)
A. Visited by FLW post-delivery	Yes	5,674	37.1 (36.3, 38.0)
	No	10,013	62.9 (62.0, 63.7)
B. Breastfeed on demand	Yes	2,189	37.8 (36.5, 39.2)
	No	3,485	62.2 (60.8, 63.5)
C. Do not give anything other than breast feed	Yes	1,586	27.8 (26.6, 29.1)
	No	4,088	72.2 (70.9, 73.4)
D. How to hold the child while breastfeeding	Yes	480	8.0 (7.2, 8.7)
	No	5,194	92.0 (91.3, 92.8)
E. How to understand whether the child is receiving enough breast milk	Yes	218	3.7 (3.2, 4.2)
	No	5,456	96.3 (95.8, 96.8)
F. Problems being faced during breastfeeding and how to solve those problems	Yes	141	2.4 (1.9, 2.8)
	No	5,533	97.6 (97.2, 98.1)
G. Advice on FLW on age to breastfeed until	Yes	2,180	14.0 (13.4, 14.6)
	No	13,507	86.0 (85.4, 86.6)
H. FLW observe breastfeeding	Yes	16,82	10.4 (13.4, 14.6)
	No	14,005	89.6 (89.0, 90.1)
Breastfeeding advice (at least one of above)	Any or some	3,131	20.3 (19.6, 21.0)
	None	12,556	79.7 (79.0, 80.4)

3-5 month advice distribution

Table 4 presents the distribution of breastfeeding advice and counseling for 3-5 month infants. Unlike the 0-2 month survey, the advice provided for 3-5 month olds was focused on when to start the introduction of complementary foods. The advice results of the 3-5 month survey is of total population instead of only those visited by and FLW compared to 0-2 month survey due to varied skip pattern of survey. Of the total sample, about 37% were visited by an FLW post-delivery, and only 13% actually received advice on when to exclusively breastfeed until (6 months). When to start complementary feeding, though an intended focus of this target group, was advised only to 10% of the total sample. The remaining of the sample was not specifically advised on accurate date to start complementary feeding.

Table 4 Distribution of breastfeeding advice or counseling for 3-5 month, LQAS+ Round 6 data, 2010-2014, n=15,687

	3-5 MONTHS		
	Categories	Unweighted frequency	Weighted proportion (%) & (its 95% CI)
A. Visited by FLW post-delivery	Yes	5,566	36.8 (35.9, 37.6)
	No	10,121	63.2 (62.4, 64.1)
B. Age to exclusively breastfeed until	Yes	1,998	12.8 (12.2, 13.4)
	No	13,689	87.2 (86.6, 87.8)
D. When to start complementary feeding	Yes	1,608	10.5 (10.0, 11.1)
	No	14,079	89.5 (88.9, 90.0)

Table 5 details the distribution of specific complementary feeding advice provided for the mothers of 3-5 month infants. By introducing knowledge and advising mothers at 3-5 months to start complementary feeding, there hopefully will be increased, accurate transition at 6 months. In

this sample, overall complementary feeding advice for future six month infants was relatively low. Only about 9% received accurate advice on age appropriate introduction of complementary feeding, 3% received advice on minimum meal frequency and a little more than 1% received advice on the minimum acceptable diet starting at six months. Less than 10% received advice on dietary advice in total. Advice on continuing breastfeeding was not included in this survey.

Table 5 Distribution of future complementary feeding advice for 3-5 month, LQAS+ Round 6 data, 2010-2014, n=15,687

	3-5 MONTHS		
	Categories	Unweighted frequency	Weighted proportion (%) & (its 95% CI)
A. Accurate advice on age appropriate introduction of complementary feeding	Yes	1,310	8.5 (8.0, 9.0)
	No	14,377	91.5 (91.0, 92.0)
B. Advice on minimum meal frequency	Yes	414	2.8 (2.5, 3.1)
	No	15,273	97.2 (96.9, 97.5)
C. Advice on dietary diversity	≥4	178	1.1 (0.9, 1.3)
	<4	1,367	9.0 (8.5, 9.5)
	No	14,142	89.9 (89.4, 90.4)
D. Advice on minimum acceptable diet (quantity)	Yes	225	1.2 (1.1, 1.4)
	No	15,462	98.8 (98.6, 98.9)

0-2 month analysis: Association between sociodemographic factors and advice/counseling

In table 6, a bivariate analysis was used to examine associations between sociodemographic factors and operational factors before adjusting for other factors. There was higher association between an FLW visit with particular sociodemographic factors, including scheduled caste/tribe

and 2 months of age Higher SES did not have higher association with being visited by FLW post-delivery and were less likely to have FLW observation of breastfeeding methods. Even after adjusting for other factors in the multivariate analysis, mothers who were either of middle or upper SES were still less likely to be visited by FLW or have FLW observation of breastfeeding.

Compared to mothers 31-49 years, mothers 14-24 years and those 25-30 years were ~1.14, ~1.25, respectively [OR=1.14, 95% CI (0.96, 1.35)], [OR=1.25, 95% CI (1.05, 1.49)], times more likely to have received any or some advice. Any or some advice was categorized by receiving one or more of the five components of breastfeeding advice (i.e. giving as frequently as infant wants, not to give anything but breast milk, etc.). Additionally, mother from a schedule caste/tribe was 1.34 [OR=1.34, 95% (1.14, 1.58)] times more likely to receive advice compared to other castes and mothers of other backwards castes were 1.23 [OR=1.23, 95% CI (1.07, 1.42)] times more like receive any or some advice. Age of child was not significant in playing a role with receiving advice or FLW observation.

Table 6 Association of all sociodemographic factors and operational factors for 0-2 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687

			0-2 MONTHS					
			Visited by FLW post delivery		**Any or Some Advice**		**FLW Observation**	
	Categories		OR (95%CI)	p Value	OR (95%CI)	p Value	OR (95%CI)	p Value
Age of Mother (Ref=30-49 years)	14-24	OR	1.16 (1.03, 1.31)	0.017	1.24 (1.06, 1.44)	0.006	0.96 (0.79, 1.15)	0.631
		AOR	1.16 (1.01, 1.34)	0.031	1.14 (0.96, 1.35)	0.130	0.91 (0.74, 1.12)	0.359
	25-30	OR	1.15 (1.01, 1.31)	0.036	1.30 (1.10, 1.52)	0.002	1.07 (0.88, 1.31)	0.494

		AOR	1.16 (1.00, 1.34)	0.051	1.25 (1.05, 1.49)	0.014	1.00(0.81, 1.24)	0.995
Religion (Ref=Muslim)	Hindu	OR	0.86 (0.79, 0.95)	0.002	0.91 (0.81, 1.01)	0.086	0.94 (0.81, 1.09)	0.399
		AOR	0.91 (0.82, 1.02)	0.094	0.93 (0.82, 1.05)	0.245	0.88 (0.75, 1.04)	0.139
Caste (Ref: Others)	SC/ST	OR	1.28 (1.15, 1.43)	<0.0001	1.21 (1.05, 1.38)	0.007	1.16 (0.97, 1.38)	0.105
		AOR	1.30 (1.14, 1.49)	0.0001	1.34 (1.14, 1.58)	0.0004	1.12 (0.91, 1.38)	0.29
	OBC	OR	1.15 (1.04, 1.27)	0.008	1.17 (1.03, 1.33)	0.014	1.12 (0.95, 1.31)	0.183
		AOR	1.17 (1.04, 1.31)	0.0103	1.23 (1.07, 1.42)	0.004	1.09 (0.91, 1.31)	0.37
Respondent's education (Ref=Illiterate)	Literate, ≤VIIIth Grade	OR	0.99 (0.90, 1.08)	0.751	1.05 (0.95, 1.17)	0.346	0.86 (0.75, 0.99)	0.041
		AOR	1.05 (0.95, 1.15)	0.387	1.09 (0.97, 1.22)	0.169	0.91 (0.78, 1.07)	0.258
	> VIIIth Grade	OR	0.96 (0.89, 1.05)	0.372	1.13 (1.02, 1.25)	0.015	1.01 (0.89, 1.15)	0.853
		AOR	0.97 (0.87, 1.07)	0.504	1.11 (0.98, 1.25)	0.096	1.14 (0.98, 1.34)	0.093
Socio-economic status (Ref=Poor)	Middle	OR	0.92 (0.85, 1.00	0.0417	1.14 (1.03, 1.25)	0.01	1.03 (0.92, 1.17)	0.598
		AOR	0.94 (0.86, 1.03)	0.1598	1.13 (1.01, 1.25)	0.033	1.01 (0.88, 1.16)	0.894
	Upper	OR	0.88 (0.81, 0.95)	0.001	1.10 (1.00, 1.21)	0.048	0.86 (0.76, 0.98)	0.019
		AOR	0.92 (0.84, 1.02)	0.108	1.11 (0.99, 1.25)	0.072	0.83 (0.72, 0.97)	0.016
Sex of child (Ref=Female)	Male	OR	1.04 (0.97, 1.11)	0.269	1.00 (0.92, 1.08)	0.926	1.00 (0.90, 1.10)	0.95
		AOR	1.05 (0.98, 1.13)	0.169	1.02 (0.93, 1.11)	0.694	1.01 (0.91, 1.13)	0.803
Age of Child (Ref=0 months)	1 month	OR	1.08 (1.00, 1.17)	0.056	1.07 (0.97, 1.17)	0.188	1.00(0.88, 1.13)	0.99
		AOR	1.12 (1.02, 1.22)	0.013	1.11 (1.00, 1.24)	0.045	1.04 (0.91, 1.20)	0.513
	2 months	OR	1.18 (1.09, 1.29)	<0.0001	1.06 (0.96, 1.17)	0.249	1.07 (0.94, 1.21)	0.295

	AOR	1.21 (1.11, 1.33)	<0.0001	1.10 (0.98, 1.22)	0.094	1.10 (0.96, 1.26)	0.172

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all sociodemographic factors in model***

Table 7 presents the association of all sociodemographic factors with early initiation of breastfeeding for 0-2 month olds in a bivariate and multivariate analysis. Compared to older mothers (30-49 years), younger mothers were more likely to have early initiation of breastfeeding after adjusting for other factors [OR=1.17, 95% CI (1.03, 1.34)]. After adjusting, Hindus were less likely to have early initiation of breastfeeding [OR=0.76, 95% CI (0.69, 0.84)] compared to Muslims. Mothers of scheduled caste/tribe were 1.23 times [OR=1.23, 95% CI (1.1.08, 1.40)] more likely to have early initiation and other backwards caste mothers were 1.11 times [OR=1.11, 95% CI (1.00, 1.24)] more likely.

Table 7 Association of all sociodemographic factors and early initiation of breastfeeding for 0-2 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687

0-2 MONTHS Early Initiation of Breastfeeding				
	Categories		OR (95%CI)	p Value
Age of Mother (Ref=30-49 years)	14-24	OR	1.27 (1.13, 1.42)	<0.0001
		AOR	1.17 (1.03, 1.34)	0.016
	25-30	OR	1.27 (1.12, 1.44)	0.0001
		AOR	1.15 (1.00, 1.32)	0.049
Religion (Ref=Muslim)	Hindu	OR	0.75 (0.69, 0.82)	<0.0001
		AOR	0.76 (0.69, 0.84)	<0.0001
Caste (Ref: Others)	SC/ST	OR	1.32 (1.19, 1.47)	<0.0001
		AOR	1.23 (1.08, 1.40)	0.002

	OBC	OR	1.18 (1.07, 1.30)	0.0007
		AOR	1.11 (1.00, 1.24)	0.0602
Respondent's education (Ref=Illiterate)	Literate, ≤VIIIth Grade	OR	1.00 (0.92, 1.09)	0.973
		AOR	1.04 (0.95, 1.15)	0.384
	> VIIIth Grade	OR	0.99 (0.91, 1.07)	0.728
		AOR	0.98 (0.89, 1.08)	0.717
Socio-economic status (Ref=Poor)	Middle	OR	1.06 (0.98, 1.14)	0.176
		AOR	1.04 (0.96, 1.14)	0.350
	Upper	OR	1.00 (0.92, 1.08)	0.940
		AOR	1.02 (0.93, 1.12)	0.745
Sex of child (Ref=Female)	Male	OR	0.97 (0.91, 1.04)	0.385
		AOR	0.96 (0.90, 1.03)	0.267
Age of Child (Ref=0 months)	1 month	OR	0.97 (0.90, 1.05)	0.495
		AOR	0.95 (0.88, 1.04)	0.262
	2 months	OR	1.00 (0.93, 1.09)	0.924
		AOR	1.00 (0.91, 1.09)	0.941

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all sociodemographic factors in model***

3-5 month analysis: Association between sociodemographic factors and advice/counseling

Similar to the 0-2 month dataset, a bivariate analysis and multivariate analysis was conducted to compare associations between sociodemographic factors and future complementary feeding advice and/or counseling. Table 8 shows analysis of visit by FLW after delivery as questions in survey did not provide information to be extracted for specific breastfeeding advice. These results are based on total 3-5 month sample. After adjusting to other factors, compared to no education, if a respondent's education level was less than 8th standard, they were 1.40 times more likely to receive complementary feeding advice [OR=1.40, 95%CI (1.20, 1.63)] and if more

than 8th standard, the were more than 1.52 times likely to receive complementary feeding advice [OR=1.52, 95% CI (1.29, 1.78)]. Before adjusting for other factors, higher SES (upper class) also meant that mothers were less likely to be visited by FLW after delivery but more likely to receive advice or counseling visited by FLW. After adjusting for other sociodemographic factors, it was noted that male children were more likely to be visited by FLW after delivery [OR=1.10, 95% CI (1.02, 1.18)].

Table 8 Association of all sociodemographic factors and operational factors for 3-5 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687

			3-5 MONTHS			
			Visited by FLW after delivery		Future CF advice	
	Categories		OR (95%CI)	p Value	OR (95%CI)	p Value
Age of Mother (Ref=30-49 years)	14-24	OR	0.83 (0.73, 0.94)	0.003	1.04 (0.85, 1.27)	0.74
		AOR	0.81 (0.70, 0.93))	0.003	0.89 (0.71, 1.11)	0.30
	25-30	OR	0.92 (0.80, 1.05)	0.2	1.09 (0.88, 1.34)	0.46
		AOR	0.90 (0.78, 1.04)	0.15	1.00 (0.79, 1.27)	1.00
Religion (Ref=Muslim)	Hindu	OR	0.98 (0.89, 1.07)	0.65	0.89 (0.77, 1.04)	0.14
		AOR	0.98 (0.88, 1.09)	0.71	0.94 (0.79, 1.11)	0.45
Caste (Ref: Others)	SC/ST	OR	1.08 (0.97, 1.21)	0.16	1.13 (0.94, 1.35)	0.18
		AOR	1.16 (1.01, 1.33)	0.03	1.40 (1.12, 1.74)	0.003
	OBC	OR	1.05 (0.94, 1.16)	0.39	1.14 (0.97, 1.35)	0.12
		AOR	1.13 (1.00, 1.27)	0.05	1.23 (1.01, 1.50)	0.04
Respondent's education (Ref=Illiterate)	Literate, ≤VIIIth Grade	OR	0.99 (0.92, 1.09)	0.99	1.34 (1.18 1.53)	<0.0001
		AOR	1.08 (0.98, 1.19)	0.13	1.40 (1.20, 1.63)	<0.0001
	> VIIIth	OR	0.96 (0.88, 1.04)	0.33	1.43 (1.26, 1.62)	<0.0001

	Grade	AOR	1.03 (0.93, 1.15)	0.54	1.52 (1.29, 1.78)	<0.0001
Socio-economic status (Ref=Poor)	Middle	OR	0.92 (0.85, 1.00)	0.04	1.12 (0.98, 1.27)	0.09
		AOR	0.94 (0.86, 1.03)	0.16	1.07 (0.92, 1.23)	0.39
	Upper	OR	0.90 (0.83, 0.98)	0.013	1.23 (1.09, 1.40)	0.001
		AOR	0.93 (0.85, 1.03)	0.14	1.08 (0.92, 1.26)	0.35
Sex of child (Ref=Female)	Male	OR	1.07 (1.01, 1.15)	0.034	1.05 (0.95, 1.17)	0.36
		AOR	1.10 (1.02, 1.18)	0.01	1.09 (0.98, 1.22)	0.13
Age of Child (Ref=3 months)	4 month	OR	1.01 (0.93, 1.10)	0.803	1.05 (0.92, 1.19)	0.47
		AOR	1.00 (0.92, 1.09)	0.99	1.03 (0.89, 1.18)	0.70
	5 months	OR	0.97 (0.89, 1.05)	0.4	1.02 (0.90, 1.16)	0.75
		AOR	0.94 (0.86, 1.02)	0.15	1.01 (0.88, 1.16)	0.90

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all sociodemographic factors in model***

Table 9 presents the association between sociodemographic factors and successful exclusive breastfeeding practice of both 0-2 month and 3-5 month infants. Data provides insight with which populations and households to target future. There were a number of determinants that indicated successful practice among 0-2 month olds. Before adjusting for other factors, Hindus were 1.16 times [OR=1.16, 95% CI (1.06, 1.28)] more likely to exclusively breastfeed compared to Muslims. Mothers of scheduled caste/tribe were 1.37 times [OR=1.37, 95% (1.24, 1.54)] more likely to exclusively breastfeed compared to 1.30 times more likely for other backwards caste [OR=1.30, 95% CI (1.17, 1.48)]. Male infants were more likely to exclusively breastfeed compared to female infants [OR=1.10, 95% CI (1.03, 1.17)].

In the 3-5 month dataset Hindus were also 1.33 times [OR=1.33, 95% CI (1.22, 1.45)] more likely to exclusively breastfeed compared to Muslims. Similar to 0-2 month olds, among the 3-5 month olds those mothers with more education than class 8 had less exclusive breastfeeding practices [OR=0.66, 95% CI (0.61, 0.72)]. Higher SES indicated decrease in likelihood of

exclusively breastfeeding [OR=0.64 95%CI (0.59, 0.69)]. Additionally, as age of child increased, the less likely the infant was to exclusively breastfeed particularly among 5 month infants compared to 3 month infants [OR=0.61, 95% CI (0.56, 0.66)]. Similar results were found among 0-2 month and also after adjusting for other factors.

Table 9 Association between sociodemographic factors and exclusive breastfeeding practice of 0-2 and 3-5 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687 per age group

			Exclusive Breastfeeding			
			0-2 MONTHS		3-5 MONTHS	
	Categories		OR (95%CI)	p Value	OR (95%CI)	p Value
Age of Mother (Ref=30-49 years)	14-24	OR	1.05 (0.94, 1.19)	0.39	0.97 (0.86, 1.09)	0.60
		AOR	1.05 (0.96, 1.15)	0.26	1.12 (0.97, 1.28)	0.12
	25-30	OR	1.08 (0.95, 1.23)	0.24	1.03 (0.90, 1.17)	0.71
		AOR	0.82 (0.70, 0.94)	0.006	1.01 (0.95, 1.27)	0.20
Religion (Ref=Muslim)	Hindu	OR	1.16 (1.06, 1.28)	0.0017	1.33 (1.22, 1.45)	<0.0001
		AOR	1.20 (1.08, 1.35)	0.001	1.30 (1.18, 1.45)	<0.0001
Caste (Ref: Others)	SC/ST	OR	1.37 (1.24, 1.54)	<0.0001	1.24 (1.12, 1.38)	<0.0001
		AOR	1.33 (1.17, 1.53)	<0.0001	1.20 (1.05, 1.37)	0.01
	OBC	OR	1.30 (1.18, 1.43)	<0.0001	1.03 (0.94, 1.14)	0.51
		AOR	1.32 (1.17, 1.48)	<0.0001	1.06 (0.95, 1.19)	0.30
Respondent's education (Ref=Illiterate)	Literate, ≤VIIIth Grade	OR	0.71 (0.65, 0.77)	<0.0001	0.71 (0.65, 0.77)	<0.0001
		AOR	0.74 (0.67, 0.82)	<0.0001	0.77 (0.70, 0.85)	<0.0001
	> VIIIth Grade	OR	0.67 (0.61, 0.72)	<0.0001	0.66 (0.61, 0.72)	<0.0001
		AOR	0.70 (0.64, 0.78)	<0.0001	0.79 (0.72, 0.87)	0.0001
Socio-economic status (Ref=Poor)	Middle	OR	0.89 (0.82, 0.97)	0.0073	0.85 (0.79, 0.92)	<0.0001
		AOR	0.89 (0.81, 0.98)	0.017	0.89 (0.82, 0.97)	0.01
	Upper	OR	0.73 (0.68, 0.79)	<0.0001	0.64 (0.59, 0.69)	<0.0001

		AOR	0.85 (0.77, 0.94)	0.002	0.73 (0.66, 0.80)	<0.0001
Sex of child (Ref=Female)	Male	OR	1.10 (1.03, 1.17)	0.005	1.04 (0.98, 1.11)	0.19
		AOR	1.09 (1.01, 1.17)	0.028	1.05 (0.98, 1.13)	0.19
Age of Child (Ref=0 months, 3 months)	1 month|||4 months	OR	0.58 (0.53, 0.63)	<0.0001	0.78 (0.72, 0.84)	<0.0001
		AOR	0.56 (0.51, 0.61)	<0.0001	0.78 (0.71, 0.85)	<0.0001
	2 months|||5 months	OR	0.45 (0.42, 0.49)	<0.0001	0.61 (0.56, 0.66)	<0.0001
		AOR	0.45 (0.41, 0.49)	<0.0001	0.59 (0.54, 0.65)	<0.0001

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all sociodemographic factors in model***

Table 10 displays the association between advice and early initiation of breastfeeding practice of 0-2 month olds through bivariate and multivariate analysis. Before adjusting for other factors, those who were received any or some advice from the FLW were 2.5 times [OR=2.54, 95% CI (2.33, 2.76)] more likely and those visited by FLW were 1.95 times [OR=1.95, 95% CI (1.82, 2.08) more likely to have early initiation of breastfeeding. Lastly, with an FLW observing practice, it was found that they were 2.47 times [OR=2.47, 95% CI (2.21, 2.76)] more likely to have early initiated breastfeeding compared to those who didn't.

Table 10 Association between advice and early initiation of breastfeeding practice of 0-2 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687

	0-2 MONTHS Early Initiation of Breastfeeding			
	Categories		OR (95%CI)	p Value
Advice (Ref=None)	Any or some advice	OR	2.54 (2.33, 2.76)	<0.0001
		AOR	2.47 (2.26, 2.71)	<0.0001
FLW visit (Ref=No)	Yes	OR	1.95 (1.82, 2.08)	<0.0001
		AOR	1.90 (1.76, 2.04)	<0.0001
FLW observation (Ref=No)	Yes	OR	2.47 (2.21, 2.76)	<0.0001
		AOR	2.36 (2.10, 2.66)	<0.0001

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all operational factors in model***

Table 11 displays the association between advice and exclusive breastfeeding practice of 0-2 month olds through bivariate and multivariate analysis. Before adjusting for other factors, those who were received any or some advice from the FLW 1.82 times more likely to breastfeed. Those who were visited by an FLW post-delivery were 1.31 times more likely to exclusively breastfeed [OR=1.31, 95% CI (1.21, 1.41)]. Of those who had an FLW observe breastfeeding practice, they were 1.52 times [OR=1.52, 95% CI (1.34, 1.72)] more likely to exclusively breastfeed as well.

Table 11 Association between advice and exclusive breastfeeding practice of 0-2 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687

	0-2 MONTHS Exclusive Breastfeeding			
	Categories		OR (95%CI)	p Value
Advice (Ref=None)	Any or some advice	OR	1.82 (1.67, 1.99)	<0.0001
		AOR	1.71 (1.56, 1.89)	<0.0001
FLW visit (Ref=No)	Yes	OR	1.34 (1.25, 1.44)	<0.0001
		AOR	1.31 (1.21, 1.41)	<0.0001
FLW observation (Ref=No)	Yes	OR	1.62 (1.44, 1.82)	<0.0001
		AOR	1.52 (1.34, 1.72)	<0.0001

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all operational factors in model***

Table 12 presents the first set of results from the final regression analysis. The final model for analysis shows how utilizing logistic regression modeling can predict early initiation breastfeeding and exclusive breastfeeding while adjusting for advice/counseling and sociodemographic factors all together. When adjusted for all sociodemographic and operational factors combined in one model, Hindus were less likely [OR=0.77, 95% CI (0.69, 0.85)] to have early initiation of breastfeeding compared to Muslims. With more breastfeeding advice, households were 1.81 times [OR=1.81, 95% CI (1.61, 2.03)] more likely to initiate breastfeeding early. In mothers of scheduled caste/tribe were 1.16 times more likely [OR=1.16, 95% CI (1.03, 1.31)] to have early initiation of breastfeeding compared to others.

In comparison, Hindus were more likely to exclusively breastfeed compared to Muslims [OR=1.26, 95% CI (1.12, 1.40)], however, higher SES indicated decreased exclusive breastfeeding

by 16% among upper class. Additionally, males were more likely to exclusively breastfeed as well when adjusted for other factors. The key result found was that infants 0-2 months that had early initiation of breastfeeding were 1.58 times [OR=1.58 95% CI (1.47, 1.69) more likely to exclusively breastfeed. This supports our initial hypothesis.

Table 12 Regression analysis between overall sociodemographic factors, program operational factors on successful early initiation of breastfeeding and exclusive breastfeeding practice of 0-2 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687 per age group

			0-2 MONTHS			
			Early Initiation of Breastfeeding		Exclusive Breastfeeding	
	Categories		OR (95%CI)	p Value	OR (95%CI)	p Value
Age of Mother (Ref=30-49 years)	14-24	OR	1.21 (1.07, 1.37)	0.004	1.21 (1.06, 1.37)	0.125
		AOR	1.16 (1.02, 1.33)	0.029	1.27 (1.10, 1.46)	0.001
	25-30	OR	1.21 (1.06, 1.37)	0.004	1.13 (0.99, 1.29)	0.171
		AOR	1.12 (0.98, 1.29)	0.109	1.20 (1.03, 1.39)	0.017
Religion (Ref=Muslim)	Hindu	OR	0.80 (0.72, 0.88)	<0.0001	1.29 (1.17, 1.43)	<0.0001
		AOR	0.77 (0.69, 0.85)	<0.0001	1.26 (1.12, 1.40)	<0.0001
Caste (Ref: Others)	SC/ST	OR	1.16 (1.03, 1.31)	0.014	1.23 (1.09, 1.40)	0.001
		AOR	1.18 (1.04, 1.35)	0.012	1.29 (1.12, 1.47)	0.0003
	OBC	OR	1.07 (0.97, 1.19)	0.199	1.23 (1.10, 1.37)	0.0002
		AOR	1.08 (0.97, 1.21)	0.162	1.29 (1.15, 1.45)	<0.0001
Respondent's education (Ref=Illiterate)	Literate, ≤VIIIth Grade	OR	1.00 (0.91, 1.09)	0.976	0.72 (0.66, 0.79)	<0.0001
		AOR	1.04 (0.94, 1.14)	0.464	0.73 (0.66, 0.81)	<0.0001
	> VIIIth Grade	OR	0.96 (0.88, 1.05)	0.364	0.71 (0.66, 0.79)	<0.0001
		AOR	0.97 (0.88, 1.07)	0.555	0.70 (0.63, 0.77)	<0.0001
Socio-economic status (Ref=Poor)	Middle	OR	1.06 (0.98, 1.15)	0.134	0.91 (0.84, 0.99)	0.035
		AOR	1.04 (0.95, 1.13)	0.427	0.88 (0.80, 0.96)	0.007

	Upper	OR	1.03 (0.95, 1.13)	0.466	0.84 (0.76, 0.92)	0.0001
		AOR	1.02 (0.92, 1.12)	0.742	0.84 (0.76, 0.93)	0.0007
Sex of child (Ref=Female)	Male	OR	0.97 (0.91, 1.03)	0.339	1.09 (1.02, 1.17)	0.014
		AOR	0.96 (0.89, 1.03)	0.206	1.09 (1.01, 1.18)	0.02
Age of Child (Ref=0 months)	1 month|||4 months	OR	0.96 (0.89, 1.04)	0.340	0.57 (0.52, 0.62)	<0.0001
		AOR	0.94 (0.86, 1.02)	0.126	0.55 (0.50, 0.61)	<0.0001
	3 months|||5 months	OR	0.99 (0.91, 1.07)	0.760	0.44 (0.41, 0.48)	<0.0001
		AOR	0.98 (0.89, 1.07)	0.569	0.44 (0.40, 0.48)	<0.0001
Breastfeeding advice total (Ref=none)	Any/some advice	OR	1.81 (1.61, 2.03)	<0.0001	1.76 (1.56, 2.00)	<0.0001
		AOR	1.82 (1.60, 2.07)	<0.0001	1.66 (1.45, 1.90)	<0.0001
FLW visit (Ref=No)	Yes	OR	1.29 (1.18, 1.41)	<0.0001	0.93 (0.85, 1.02)	0.0125
		AOR	1.27 (1.15, 1.40)	<0.0001	0.95 (0.86, 1.06)	0.352
FLW observation (Ref=No)	Yes	OR	1.44 (1.26, 1.64)	<0.0001	1.10 (0.96, 1.26)	0.171
		AOR	1.39 (1.21,1.60)	<0.0001	0.95 (0.86, 1.06)	0.397
Early initiation of breastfeeding (Ref=No)	Yes	OR	---	---	1.58 (1.47, 1.69)	<0.0001
		AOR	---	---	1.56 (1.45, 1.69	<0.0001

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all sociodemographic and operational factors in model***

In Table 13, 3-5 month olds presented results that supported the hypothesis that both advice/counseling and sociodemographic factors can play a role in the indicated successful exclusive breastfeeding practice. This table is the second set of results from the final regression analysis. The model for analysis again, utilized logistic regression modeling to predict exclusive breastfeeding while adjusting for advice/counseling and sociodemographic factors all together. After adjusting for all sociodemographic and operational factors combined in one model, Hindus

were more likely [OR=1.40, 95% CI (1.27, 1.54)] to exclusively breastfeed compared to Muslims during 3-5 months. With complementary feeding advice in conjunction with breastfeeding counseling, they were 1.50 times [OR=1.50, 95% CI (1.33, 1.69)] more likely to early initiation of breastfeeding. In the adjusted model, mothers of scheduled caste/tribe were 1.20 times more likely [OR=1.20, 95% CI (1.06, 1.35)] to exclusively breastfeed compared to other castes.

Infants 3-5 months born to mothers who were more educated [OR=0.77, 95% CI (0.70, 0.86)] and of higher SES [OR=0.72, 95% CI (0.66, 0.79)] were less likely to exclusively breastfeed. Lastly, mothers who were visited by an FLW were also more likely [OR=1.15, 95% CI (1.05, 1.25)] to exclusively breastfeed compared to those who were not.

Table 13 Regression analysis between overall sociodemographic factors, program operational factors on successful exclusive breastfeeding practice of 3-5 month olds, LQAS+ Round 6 data, 2010-2014, n=15,687 per age group

		3-5 MONTHS Exclusive Breastfeeding		
	Categories		OR (95%CI)	p Value
Age of Mother (Ref=30-49 years)	14-24	OR	1.15 (1.01, 1.30)	0.034
		AOR	1.13 (0.98, 1.30)	0.086
	25-30	OR	1.10 (0.96, 1.25)	0.161
		AOR	1.10 (0.95, 1.27)	0.197
Religion (Ref=Muslim)	Hindu	OR	1.40 (1.27, 1.54)	<0.0001
		AOR	1.31 (1.18, 1.45)	<0.0001
Caste (Ref: Others)	SC/ST	OR	1.20 (1.06, 1.35)	0.003
		AOR	1.17 (1.03, 1.34)	0.016
	OBC	OR	1.05 (0.94, 1.17)	0.380
		AOR	1.05 (0.93, 1.18)	0.451

Respondent's education (Ref=Illiterate)	Literate, ≤VIIIth Grade	OR	0.74 (0.68, 0.81)	<0.0001
		AOR	0.75 (0.68, 0.83)	<0.0001
	> VIIIth Grade	OR	0.75 (0.69, 0.83)	<0.0001
		AOR	0.77 (0.70, 0.86)	<0.0001
Socio-economic status (Ref=Poor)	Middle	OR	0.90 (0.83, 0.97)	0.007
		AOR	0.89 (0.81, 0.97)	0.007
	Upper	OR	0.72 (0.66, 0.78)	<0.0001
		AOR	0.72 (0.66, 0.79)	<0.0001
Sex of child (Ref=Female)	Male	OR	1.03 (0.96, 1.09)	0.46
		AOR	1.04 (0.97, 1.12)	0.241
Age of Child (Ref=0 months)	4 months	OR	0.77 (0.71, 0.83)	<0.0001
		AOR	0.78 (0.71, 0.85)	<0.0001
	5 months	OR	0.60 (0.55, 0.65)	<0.0001
		AOR	0.59 (0.54, 0.65)	<0.0001
Exclusive Breastfeeding advice (Ref=none)	Yes	OR	1.57 (1.36, 1.81)	<0.0001
		AOR	1.53 (1.31 (1.79)	<0.0001
Complementary feeding advice total (Ref=none)	Any/some advice	OR	1.11 (0.95, 1.29)	0.189
		AOR	1.09 (0.92, 1.29)	0.302
FLW visit (Ref=No)	Yes	OR	1.18 (1.09, 1.27)	<0.0001
		AOR	1.15 (1.05, 1.25)	0.002

Unadjusted is a bivariate analysis of data that examines each relationship individually
****Adjusted is a multivariate analysis of data that includes all sociodemographic and operational factors in model***

DISCUSSION

The magnitude of child undernutrition is still overwhelming in India, specifically, Bihar, with high incidence attributed to factors including low intake of nutritious food, availability of health services and inadequate frontline worker involvement (Sinha, 2012). CARE India's initiative to improve maternal and child health through nutrition by increasing availability of resources and consistent access to high quality interventions (CARE India, 2011). The results of this study suggest that breastfeeding practices are influenced by a variety of factors, including both sociodemographic and operational factors. These results hold important implications for local and national interventions and programs aimed at increasing successful breastfeeding practices post-delivery. There is still room for development of focused interventions within rural communities for long term success.

Nutrition interventions presented early in life might have lasting, life-long effects. The WHO recommends that women should initiate breastfeeding within one hour of birth and exclusively breastfeed their infants for up to six months (WHO, 2015). The results of this study support the hypothesis that sociodemographic factors and proper advice and counseling from frontline workers for mothers of infants 0-5 months old is an important determinant for successful exclusive breastfeeding practice. The important findings found from this analysis will be supported with recommendations to improve quality of current CARE work conducted in Bihar.

The aim of this study was to identify key determinants of early initiation of breastfeeding and exclusive breastfeeding practice in order to understand any potential opportunities to improve IYCF programming and targeting. Overall recommendations for improvement of current CARE interventions and training of FLWs will be addressed to increase effectiveness of programming as a whole.

Key Findings

Despite the high rate of infants that are currently breastfeeding, 34% of infants 0-2 months and 54% of infants 3-5 months that are not being exclusively breastfed. The results indicated that younger mothers were more likely to initiate breastfeeding early and exclusively breastfeed compared to older mothers. Mothers with higher socioeconomic status were more likely to initiate breastfeeding earlier than those from lower socioeconomic class across 0-5 months however, they were less likely to exclusively breastfeed. Additionally, educated mothers were less likely to exclusively breastfeed compared to those were illiterate or no formal education.

Surprisingly, among both the 0-2 and 3-5 months, religion produced varied results contrary to expectations. In this study, Hindus were less likely to have early initiation of breastfeeding but were more likely to exclusively breastfeed. However, research has shown that the religious and cultural basis for contemporary breastfeeding practices amongst Hindus emphasizes any or some breastfeeding, albeit not specifically early initiation or exclusively (Laroia & Sharma, 2006). One key explanation for this is the traditional practice of prelacteal feed given to the newborn which delays initiation of breastfeeding (Laroia & Sharma, 2006). Limited data available on whether Hindus versus Muslims are more likely to give prelacteal feed.

According to NFHS data, almost 91% of children born in the five years preceding the survey received a prelacteal feed (IIPS, 2007). Prelacteal feeds can include honey, jaggery, ghee (clarified butter) and are sometimes believed to be a necessary substitute for colostrum (McKenna & Shankar, 2009). In ancient Hindu scriptures, it has been noted that delaying breastfeeding until the fifth day is described as most beneficial to mother and child and mothers are instructed to discard the initial colostrum as it may be harmful to newborn (Laroia & Sharma, 2006). Though these spiritual texts underscore the importance of breastfeeding in Hindu communities, beliefs about prelacteal feeds and colostrum may explain low rates of early initiation of breastfeeding.

Cultural and religious influence on breastfeeding practice indicates the necessary support and counseling of mothers before and after delivery.

The results of this study reveal that there are significant gaps between respondent education and breastfeeding practices across 0-5 months. In one cross-sectional study in north Jordan, there was evidence that women with higher education were less likely to breastfeed compared to lower education women (Khassawneh, et al., 2006). This may be attributed to mass media and western influences promoting formula feeding versus breastfeeding. In these results, as respondent education increased, both early initiation and exclusive breastfeeding practice decreased though guidelines should be more accessible to more educated women. It is important to note that majority of mothers were illiterate and may rely more on advice of FLW compared to those of higher education. Currently, there is limited research on the use of formula or breast milk substitutes among higher educated women in India.

Key determinants that were associated with higher rates of exclusive breastfeeding included, visits from frontline worker post-delivery, advice from frontline worker on breastfeeding practice, and frontline worker observation while breastfeeding. Indicators of advice and counseling showed varied effects of successful exclusive breastfeeding practice. This study showed that mothers who were visited by an FLW and counseled on the breastfeeding process were more likely to initiate early and continue breastfeeding until six months and exclusively. There are a few exceptions where single indicators showed no effect on exclusive breastfeeding practice and overall continued breastfeeding practice. While previous studies have found that duration of breastfeeding may be a predictor of increased child survival, it is still important to note the impact of strong support systems post-delivery to encourage successful breastfeeding practices (Bhutta, et al., 2008).

The Government of Bihar has taken large strides in focusing program efforts to decrease maternal and child deaths and increase nutrition (Sinha, 2012). NFHS estimates of statewide incidence of undernutrition among children under three for Bihar was over 55% (IIPS, 2007). Because of this, it is crucial to encourage proper antenatal and postnatal nutrition practices to ensure healthy nutritional status. In a recent meta-analyses, researchers found that in the presence of adequate support through individual counseling or group education interventions increased exclusive breastfeeding by over 49% and any breastfeeding by 66% (Rollins, et al., 2016). Their review of the evidence and country case studies showed that with successful promotion and support of breastfeeding at all levels, could foster positive, lasting views of optimal breastfeeding (Rollins, et al., 2016).

Gender also played a role in breastfeeding practice. It was found that males 0-2 months were more likely to be visited by an FLW post-delivery and exclusively breastfeed. Additionally, those visited by and FLW and with observation were significantly more likely to initiate breastfeeding earlier. Recent research investigated the role of gender on breastfeeding practices in India, as the stark contrast still lies with boys having clear survival advantages (Fledderjohann, et al., 2014). Indian girls were breastfed for shorter periods than boys and consumed less milk (Fledderjohann, et al., 2014). By focusing efforts on counseling and advice visits with FLW immediately after delivery presents a significant recommendation for CARE India to encourage for future interventions addressing gender disparities across Bihar.

These results have also provided more insight on which target groups to encourage early initiation and exclusive breastfeeding up to six months. It was seen across 0-5 months, that with advice or counseling the likelihood of early initiation of breastfeeding and exclusive breastfeeding would increase significantly. These target groups include, Hindu mothers, more educated

respondents, and older infants, all the while continuing current targets. Support on a community level and from frontline workers can provide mothers that need the extra guidance to establish and continue breastfeeding.

Research Limitations

There were several limitations in this study that need to be considered when interpreting the results from this survey. In the 0-2 month survey, it was unclear whether observation of breastfeeding was considering time of observation. Early initiation of breastfeeding is recommended to occur within one hour of delivery, however, in this survey it was not certain whether the FLW observation of breastfeeding was at that first feed or later in the two months. The timing of FLW visits needs to be considered in future research.

Second, the respondents to the 3-5 month survey were asked about IYCF recommendations on breastfeeding but there were limited questions regarding perceptions of breastfeeding practices after receiving advice from frontline worker. According to one study in Xinjian, PR China, programs are needed to correct traditional, inappropriate breastfeeding perceptions and practices to encourage proper feeding habits (Xu, et al., 2007). By incorporating more detailed questions that target population perceptions and views of breastfeeding practices after being visited by frontline worker could present more information on how to address disparities in specific communities.

Third, data on early initiation of breastfeeding for the 3-5 month olds was not included in the initial survey. This limits the amount of analyses that could be done to best understand whether those infants who were exclusively breastfeeding also initiated breastfeeding within one hour of birth. The protective association between early initiation and other health outcomes could encourage practices in less developed settings.

Lastly, due to the nature of a cross-sectional analysis, these findings make it difficult to make causal inference. This is only a snapshot of the current situation and could provide potentially varied results had the time frame of data collection been different as the temporal relationship between exposures and outcomes are difficult to determine.

Research Strengths

There a several strengths in this study. One of the greatest strengths of this study is that it has a large sample size. A sample size this large is advantageous to interpret significant results as it allows for more precise estimates of the effects of sociodemographic and program operational factors (Biau, et al., 2008). It also makes it easier to generalize the results for scaling up programs (Biau, et al., 2008).

Additionally, this study examines exclusive breastfeeding at multiple levels rather than focusing on specific household characteristics. By integrating components of sociodemographic factors and operational factors, it encourages the emphasis of breastfeeding advice and counseling on successful breastfeeding practice. These key influences of breastfeeding practices are indicative of successful promotions in the realm of breastfeeding. The translation of early initiation of breastfeeding to exclusive breastfeeding provides a unique perspective of how advice can impact techniques used to target programming directly to mothers. Additionally, the results of this cross-sectional analysis provide a general idea of prevalence of exposure and outcome.

Objective 3:

To identify gaps, barriers and opportunities to desired breastfeeding practices within rural communities to improve IYCF programming in the future.

This section will identify program gaps, barriers and opportunities to desired breastfeeding practices within rural communities in order to improve future household practices and IYCF in Bihar, India. To improve both early initiation and exclusive breastfeeding practices in Bihar, India, it is essential to review potential recommendations for program improvements. With that, there is still a significant amount of future research that needs to explore the key determinants of breastfeeding practices and IYCF practices as a whole.

Program Gaps

To effectively reach mothers of infants 0-5 months, a critical step is to gather evidence on gaps in current programming and targets that influence practice. The following is a summary of program gaps that were found based on this study.

Frontline worker visits

There is still a considerable need for frontline worker visits post-delivery. As shown in the results, only 37% are actually being visited by an FLW after delivery and fewer than 54% in all of Bihar are initiating early breastfeeding. With the FLW visit, the likelihood of early initiation and exclusive breastfeeding significantly increases, yet the current gap in FLW visits is still cause for concern. The service gap of counseling and providing advice limits the benefits of successful practice to mothers who need additional guidance after delivery.

Feeding practices

Additionally, there are gaps in appropriate feeding practices for among both newborns and infants up to six months. When assessing exclusive breastfeeding, mothers were asked to self-

report whether or not anything other than water was given to the infant. Only about 66% of mothers in the 0-2 months and 46% in the 3-5 months were reported to have been exclusively breastfeeding their infant. This information was a self-reported measure yet there was low prevalence of exclusive breastfeeding.

Barriers

Though counseling were provided through postpartum home visits, frontline worker observations of breastfeeding practice, and verbal advice, the results suggest that there is still a significant number of mothers that were still lacking accurate advice on breastfeeding practice from the frontline worker. Early initiation of breastfeeding and exclusive breastfeeding was associated with FLW involvement and counseling throughout post-delivery though odds ratios were still low. Improving quality of counseling would be necessary to assess accurate advice given.

By understanding the sociodemographic and cultural barriers to early initiation and exclusive breastfeeding, CARE India can target specific groups that have significantly lower rates of practice. High risk groups include Hindu mothers, mothers with higher education, older children (specifically 4 and 5 months).

Opportunities

In this study, results showed that when mothers initiated breastfeeding early they were more likely to exclusively breastfeed. The benefits of breastfeeding have recently been widely acknowledged, especially in low-resource settings. These benefits include improved infant nutrition, growth, development, prevention of long-term chronic diseases and reduced morbidity and mortality (Alive and Thrive, 2010). The WHO and UNICEF recommended initiation of

breastfeeding within one hour of birth and exclusive breastfeeding for the first six months (WHO, 2015). Recent evidence has indicated that early initiation and exclusive breastfeeding are both linked with substantially lower neonatal mortality (Edmond et al., 2006; Mullany, et al., 2008).

Another program opportunity is assessing the impact on advice shared among mothers. Though it would be useful to incorporate FLW involvement across Bihar, it may also be valuable to understand where advice comes from for those who don't receive FLW visits. Adopting and reinforcing the benefits of breastfeeding and encouraging the positive early breastfeeding experience between mother and infant can help mothers establish breastfeeding practices early on.

Program Recommendations

The findings and recommendations from this study can be used to modify and enhance existing programming. Improving existing programming of FLW training could present extremely valuable results in future studies.

Training of Frontline Workers

FLWs have strengthened current programming by acting as accessible resources for mothers and communities. However, there are still inconsistencies regarding what knowledge is spread to the mothers regarding feeding practices. Incorrect advice and counseling given by the frontline workers poses new challenges. It is recommended that further training is provided on exact dates to continue breastfeeding until, exclusive breastfeeding and when to start complementary feeding. Future complementary feeding advice given at 3-5 months needs to be reinforced for FLWs through further training on quantity, consistency, frequency and diversity of foods. During 3-5 months, the FLW should be informing mothers of these components of complementary feeding to ensure that by six months, the infant has a smooth transition while feeding.

The WHO and UNICEF developed a 40-hour breastfeeding counseling training course that can train frontline workers to provide skilled support to breastfeeding mothers and assist them to overcome any problems that arise so as to promote appropriate breastfeeding and complementary feeding (WHO, 2015). Though this training course may be most effective in Hindi, this could serve as a guide to train frontline workers working with CARE India on disseminating proper breastfeeding counseling to more mothers. Knowledge of FLWs is high but may require further guidance on problem solving to reach breastfeeding goals. By providing FLWs with more applicable knowledge and skills, they may feel empowered to confidently advise and counsel mothers effectively.

Community outreach

An alternative method of frontline worker reaching mother may include a community wide forum of the pregnant women where they gather with frontline worker who will detail necessary breastfeeding information in an interactive manner. Mothers can ask questions regarding practice and even bring currently breastfeeding children to help with problems during breastfeeding. This forum provides mothers with an opportunity to learn breastfeeding techniques and receive individualized help from the frontline workers. Additionally, preparing women for breastfeeding plans through antenatal and postnatal care visits, community mobilization and counseling can increase breastfeeding rates throughout communities in Bihar through positive relationships with local FLWs.

Increased Visits of Frontline Workers

It was clearly noted that populations that were receiving holistic advice on breastfeeding were more likely to have successful breastfeeding practice. Though FLWs may already have too high of expectations, it is essential that incorporating methods, like those mentioned above, are

considered so they can reach more mothers at once. Increasing contact with skilled health professionals with emphasis of counseling skills and actions may effectively support mothers in the first few visits to make them feel comfortable with FLW. This would increase efficiency and hopefully increase breastfeeding practices as well.

Future Research

There a number of future research opportunities that can provide valuable information regarding programmatic changes that need to be made. By developing and assessing current programs delivered to mothers and infants, these ideas for research can provide insight on how to better tailor services based on the needs of the population and emphasize the importance of breastfeeding in the future.

Translation of breastfeeding practice into complementary feeding practice

There was limited exploration of translation of successful breastfeeding practice into complementary feeding practice. By assessing the continuum of nutrition practices may help create lasting interventions that provide continued safe breastfeeding practice. In our results, overall complementary feeding advice for future six month infants was relatively low, with only 8.5% receiving accurate advice on age appropriate introduction of complementary feeding, 2.8% receiving advice on minimum meal frequency and 1.2% receiving advice on the minimum acceptable diet starting at six months. The examinations of advice provided by frontline worker on complementary feeding during 3-5 month age, it can give better understanding of what impacts future complementary feeding practice however this was not assessed in this study. Future research should look at the various stages of feeding within one population to see how translation occurs.

Health sub-centers

An interesting area of research is the comparison of breastfeeding practices among health sub-centers (HSCs) in the 8 focus districts compared to other HSCs could be valuable to see how that impacts breastfeeding results. A study conducted at the world bank reported absenteeism among primary care workers in India was at almost 40%--the highest in the world, but it would be interesting to understand rates in Bihar (World Bank, 2008). In settings like Bihar, the shortage of frontline and skilled health workers influences reluctance of personnel to work in multiple locations. From a program perspective, it may be essential to see how different HSCs are being targeted and who may be left out due to frontline worker conflict or absenteeism. At the same time, various types of FLWs including Accredited Social Health Activists (ASHA), Anganwaadi Workers (AWW), and Auxiliary Nurse Midwifes (ANM) have significantly different positions when it comes to providing advice. It would be valuable to examine the breakdown of FLWs and their impact and effectiveness within specific communities. This would make training of FLWs more useful if it was known which specific type of FLW was most effective with counseling mothers on the practice of breastfeeding, and include more sensitive measure of breastfeeding counseling quality.

Qualitative analysis

Another recommendation for future research includes more qualitative analysis of the current data. Focus group discussions and in-depth interviews with both mothers and FLWs would assist in addressing gaps and barriers with successful practice of breastfeeding. Focus groups are an effective tool that involve various mothers of a community to measure quality and impact of services provided. This medium will foster disclosure of the program and processes that otherwise

may not be addressed. The in-depth interviews would be most useful for CARE to understand the inconsistencies and setbacks related to FLWs.

Following up with the mothers with to understand perceptions and emphasize importance of feeding timelines across age groups. This would also be a good transition to introduce more programs organized by the Government of Bihar on a statewide level. Assessment of the household differences in diet and traditional offerings could be valuable in the initiation of breastfeeding and continued exclusive breastfeeding up until six months.

CONCLUSION

This thesis examined the current early initiation and exclusive breastfeeding practices among 0-5 month infants in Bihar, India and identified key determinants of successful practices. Lastly, this thesis identified gaps, barriers and opportunities to desired breastfeeding practices within rural communities in Bihar, to improve CARE India's IYCF programming in the future. It was found that early initiation of breastfeeding was strongly associated with exclusive breastfeeding among 0-2 month olds. Upon further examination, mothers who were visited by a frontline worker postpartum and was given breastfeeding advice were more likely to exclusively breastfeed. Based on these findings, recommendations were proposed to assist CARE in increasing outreach of breastfeeding messaging through the services of FLWs.

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