Annals of Global Health
VOL. 83, NO. 3–4, 2017

ISSN 2214-9996/$36.00
https://doi.org/10.1016/j.aogh.2017.10.012

ORIGINAL RESEARCH

Suboptimal Breastfeeding Practices among Women in Rural and Low-Resource Settings: a Study of Women in Rural Mysore, India

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Abstract

BACKGROUND Breastfeeding rates are progressively increasing worldwide while optimal breastfeeding practices are lagging behind, especially in rural and low resource settings like India.

OBJECTIVES This study estimated the prevalence of and factors associated with suboptimal breastfeeding practices among mother-infant dyads in rural southern India.

METHODS This is a cross-sectional analysis of data collected in Mysore District from 2008-2011 from 1294 mother-infant dyads. All women answered an interviewer-administered survey, which included maternal, infant, and sociodemographic information and breastfeeding-related characteristics. Logistic regressions were conducted to determine factors associated with suboptimal breastfeeding practice.

FINDINGS About 20% (n = 281) of mothers reported delayed initiation of breastfeeding. Mothers who were unsatisfied with the infant's gender had higher odds of delayed breastfeeding (adjusted odds ratio [AOR]: 1.42, 95% confidence interval [CI]: 1.00, 2.00). Odds of delayed initiation were significantly lower among mothers who received 7-10 antenatal checkups (AOR: 0.59, 95% CI: 0.41, 0.87) and assistance during breastfeeding (AOR: 0.73, 95% CI: 0.57, 0.95). About half (51.4%) the sample did not breastfeed exclusively for the first 6 months. Older age was associated with lower odds of nonexclusive breastfeeding (AOR: 0.95, 95% CI: 0.92, 1.00). Compared with mothers with no education, mothers with primary education (AOR: 1.94, 95% CI: 1.35, 2.79) or more than primary education (AOR: 1.58, 95% CI: 1.10, 2.26) had higher odds of nonexclusive breastfeeding.

CONCLUSIONS Optimal breastfeeding practices were influenced by a multitude of factors, including maternal age, education, number of antenatal checkups, receiving assistance with breastfeeding, and satisfaction with the infant's gender. Health promotion efforts should focus on encouraging mothers to attend antenatal care visits. Early antenatal education and counseling should include breastfeeding education in early antenatal visits. Further research should examine how to mitigate the effect of gender preference on initiation of breastfeeding.

KEY WORDS delayed breastfeeding, determinants, India, infant, nonexclusive breastfeeding, practices, rural.

The authors declare that they have no competing interests.
This program was funded by the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF) International Leadership Award to Dr. Madhivanan and the Positive Action for Children Fund. Karl Krupp is funded on the Global Health Equity Scholars Training Grant (D43 TW010540). Holly Nishimura was funded by the NIH National Center on Minority Health & Health Disparities (T37MD003406). The funders had no role in the study design, data collection, management, analysis, or interpretation of the data, and preparation, review, or approval of the manuscript.
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May–August 2017: 577–583

INTRODUCTION

Breastfeeding is the most natural way of nurturing infants and the most cost-effective and health-promoting form of infant feeding that mothers can easily perform. Human milk is considered an infant's first immunization, primes the gastrointestinal tract, and affects the postnatal adaptation of neonates.[1] It is estimated that if breastfeeding were universal, 823,000 deaths per year in low- and middle-income countries could be prevented.[1] Since the early 1970s, the World Health Organization (WHO) and UNICEF (the United Nations International Children's Emergency Fund) have promoted breastfeeding practices through development of international standards and policies. These include the WHO International Code of Marketing of Breast Milk Substitutes (1981), the WHO/UNICEF joint statement "Protecting, Promoting and Supporting Breastfeeding" (1982), the "Innocenti Declaration on the Protection, Promotion, and Support of Breastfeeding" (1990), and the Baby-Friendly Hospital Initiative (1992). Two of these breastfeeding practices include early initiation of breastfeeding (within 1 hour of birth) and exclusively breastfeeding the child for first the 6 months.[2]

Although breastfeeding rates are progressively increasing worldwide, optimal breastfeeding practices are lagging behind, especially in rural and low-resource settings,[3-5] including rural populations in India. According to the 2015 World Breastfeeding Trends Initiative Report, India ranked 78 out of 150 countries surveyed on breastfeeding practices with fewer than half (44.6%) of newborns born annually breastfed within the first hour of birth and about two-thirds (64.9%) optimally breastfed during the first years of life.[6] Therefore, understanding and identifying factors associated with suboptimal breastfeeding practices in rural and low-resource settings can help improve nutrition care in early years of life and contribute to achieving the United Nations Sustainable Development Goal 3 (SGD 3) of reducing neonatal mortality to at least as low as 12 neonatal deaths per 1000 live births by 2030.[7] This paper discusses the factors associated with suboptimal breastfeeding practices, defined as delayed initiation and nonexclusive breastfeeding, in rural Mysore, India.

METHODS

Setting. There are 3,001,127 residents of Mysore District, of whom 1,489,527 (49.6%) are female. More than half (58.6%) of residents live in Mysore District's 1332 rural villages. The annual per capita income is estimated at INR16,086 [US$322] for rural residents compared with an all-India annual per capita income of INR38,005 [US$760]. The literacy rate among rural residents (63.3%) is lower than country's overall literacy rate (74.0%). Residents of Mysore District identify as Hindu (87.7%), Muslim (9.7%), Christian (1.3%), or other religion (1.3%).[8,9]

Sample. A prospective cohort study was conducted by the Public Health Research Institute of India (PHRII) from April 2008–March 2012 in Mysore District, Karnataka, India to assess the acceptability and feasibility of using mobile medical clinics to provide integrated antenatal care and HIV testing. PHRII staff received permission from community leaders before initiation of any activities in the community. With the support of community leaders, all residents of the community were invited to participate in an education and awareness program. Pregnant women were given details about the mobile clinic during the education program and were invited to attend the following day. All participants were asked to provide written or oral consent. Women were excluded if they could not provide written or oral consent.

The study was reviewed and approved by the Institutional Review Boards of the PHRII and Florida International University, Miami, Florida.

Data Collection. This cross-sectional analysis was nested in the cohort study. Staff interviewed expectant mothers attending mobile clinics before births. Two follow-up interviews were conducted at the mothers' homes within 15 days after birth and again at 6 months after birth.

Measurement. Participants answered a pretested standardized interviewer-administered questionnaire based on National Family Health Survey to collect information on a child's birth history, general health, immunization schedule, and breastfeeding status and a woman's general health, sexual health, birth preparedness after current pregnancy, and other demographic characteristics. The study outcomes were suboptimal breastfeeding practices, which included "delayed initiation" and "nonexclusive" breastfeeding practices. In accordance with the WHO Infant and Young Child Feeding indicators, we defined "delayed initiation" practice as when a mother did not start breastfeeding her child within 1 hour of delivery and "nonexclusive" practice as when a mother did not breastfeed her child exclusively for 6 months without supplementation (eg, infant formula or other mother's milk supplements). Based on the existing literature, we identified 13 independent variables that could

potentially influence women's optimal breastfeeding practices. These included maternal characteristics such as *maternal age at delivery* (years), *education* (none, primary, or more than primary), *occupation* (yes or no), *parity*, *antenatal care* (number of antenatal checkups), *birth attendant* (traditional birth attendant, relative, auxiliary nurse midwife, or doctor), and *mode of delivery* (vaginal or caesarian); infant characteristics such as infant *gender* (male or female); sociodemographic characteristics including monthly *household income* (<4000, 4001-10,000, or >10,000 rupees), *religion* (Hindu or Muslim), *place of delivery* (home, government health centers, or private maternity nursing homes); and social support and emotional characteristics including *assistance during delivery* (yes or no) and *happy with infant gender* (yes or no). We categorized antenatal care using the number of checkups that a woman had during pregnancy, and monthly household income into 4 categories, as previously described.[7]

Data Analysis. Descriptive statistics were performed and reported using frequencies and proportions for categorical variables and median and interquartile range (IQR) for continuous variables. Bivariate analyses were conducted to determine differences in maternal and infant characteristics and sociodemographics in mothers who reported delayed initiation versus those who did not and in mothers who reported nonexclusive breastfeeding practice versus those who did not using χ^2 statistical test for categorical variables and Kruskal-Wallis test for continuous variables. Univariate logistic regressions were used to identify variables associated with the outcome. Multiple logistic regressions were used in a stepwise backward elimination method to estimate the adjusted odds ratios of timely initiation and exclusivity breastfeeding, adjusting for other variables in the model. For adjusted analysis, only those variables found to be significantly associated in the unadjusted analysis were considered in the model building. Factors that were not significant ($P > .05$) were eliminated in a stepwise manner. We did not include occupation and religion of a mother in the regression models because of an absence of variability. A 2-sided confidence interval was used for all statistical inferences. All analyses were conducted using SAS Version 9.4 (SAS Institute Inc., Cary, NC).

RESULTS

A total of 1294 mother-infant dyads were included in the study out of the 1538 because of issues with missing data. Of these, 244 (15.9%) women in the cohort had missing information on study measures. No significant differences between women with missing data and women without missing data by maternal, infant, sociodemographic, and emotional characteristics were identified ($P > .05$). Table 1 presents the sociodemographic characteristics of the mothers in the cohort. The median age of mothers was 20 years (IQR: 19-22). Almost half of participants were educated through primary school (39.5%) or higher (47.5%) and were primigravida (53.8%). The primary religion reported was Hindu (99.1%). Nearly half (51.4%) of the households earned less than INR4000 monthly, and almost all participants (97.3%) were not employed. The most common mode of delivery was vaginal (83.2%), and more than half (56.7%) of women delivered in a subcenter, primary health care facility, or district health center. Births were most commonly attended by a doctor or nurse (86.2%). Most women received between 7 and 10 antenatal visits (69.6%) and breastfeeding assistance (66.3%). There were slightly more births of boys (52.0%) in the study than girls (47.5%). The median birth weight was 2.8 kg (IQR: 2.5-3.0). Although 56.7% of the births were full term, a considerable percentage were also preterm (43.2%).

Delayed Initiation of Breastfeeding. About 32.3% (n = 419) of mothers reported delayed initiation of breastfeeding. After adjusting for the preselected variables in the multivariable logistic regression, education, number of antenatal visits, receiving assistance with breastfeeding, and satisfaction with infant gender were significant predictors of delayed breastfeeding (Table 2). Mothers with 7-10 antenatal checkups (AOR 0.59, 95% confidence interval [CI]: 0.41, 0.87) during the study period had lower odds of delayed initiation of breastfeeding compared with mothers with fewer than 4 antenatal checkups. Women who had assistance during breastfeeding (AOR 0.73, 95% CI: 0.57, 0.95) had lower odds of delaying breastfeeding compared with mothers without assistance. Mothers who reported being unsatisfied with their infant's gender had increased odds (AOR 1.42, 95% CI: 1.00, 2.00) of delaying breastfeeding compared with mothers who were satisfied with the gender.

Nonexclusive Breastfeeding. About half (51.4%) the women did not breastfeed their children exclusively for 6 months. Table 3 describes the multivariable logistic model examining the factors associated with nonexclusive breastfeeding. Older age was associated with slightly lower odds of nonexclusive breastfeeding. Higher odds of nonexclusive breastfeeding were found among mothers with

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Table 1. Suboptimal Breastfeeding Practices Among Women in Rural Southern India by Maternal, Infant, and Birth Characteristics (N = 1294)

	Breastfeeding Practices		
Characteristics	Delayed Initiation (n = 419)	Nonexclusive (n = 665)	Study Cohort (N = 1294)
Maternal Characteristics	*n (%)*	*n (%)*	*n (%)*
Maternal age, y			
(Median, IQR)	20 (19-22)	20 (19-22)*	20 (19-22)
Maternal education (y)			
No education	67 (16.0)	45 (6.8)	168 (13.0)
Primary (1-7 y)	158 (37.7)†	280 (42.1)*	511 (39.5)
More than primary (>7 y)	194 (46.3)†	340 (51.1)‡	615 (47.5)
Parity			
Primigravida	219 (52.3)	359 (54.0)	696 (53.8)
Multigravida	200 (47.7)	306 (46.0)	598 (46.2)
Religion			
Hindu	417 (99.5)	695 (99.1)	1280 (99.1)
Muslim	2 (0.5)	6 (0.9)	12 (0.9)
Household income, INR			
≤4000	226 (53.9)	340 (51.1)	665 (51.4)
4001-10,000	160 (38.2)	280 (42.1)	536 (41.4)
>10,000	33 (7.9)	45 (6.8)	93 (7.2)
Infant Characteristics			
Gestational age			
Preterm	181 (56.8)	295 (44.4)	559 (43.2)
Term	238 (43.2)	370 (55.6)	735 (56.8)
Birth weight (kg), median (IQR)	3.0 (2.5-3.1)	2.8 (2.5-3.0)	2.8 (2.5-3.0)
Infant gender			
Female	187 (44.6)	351 (46.8)	614 (47.5)
Male	230 (54.9)	395 (52.8)	673 (52.0)
Twins	2 (0.5)	3 (0.5)	7 (0.5)
Happy with infant gender			
No	64 (15.3)	84 (12.6)	153 (11.8)
Yes	355 (84.7)‡	581 (87.4)	1141 (88.2)
Characteristics of birth			
Antenatal checkups			
<4	55 (13.1)	78 (11.7)	134 (10.4)
5-6	97 (23.2)	136 (20.5)	241 (18.6)
7-10	259 (61.8)‡	444 (66.8)†	901 (69.6)
>10	8 (1.9)	7 (1.1)	18 (1.4)
Place of delivery			
Home	18 (4.3)	28 (4.2)	51 (3.9)
Subcenter/PHC/district health	248 (59.2)	388 (58.4)	733 (56.7)
Maternity/private nursing home	153 (36.5)	249 (37.4)	510 (39.4)
Birth attendant			
Traditional birth attendant (TBA)	9 (2.2)	13 (2.0)	24 (1.9)
Relative	8 (1.9)	14 (2.1)	25 (1.9)
Auxiliary nurse midwife (ANM)	57 (13.6)	74 (11.1)	130 (10.1)
Doctor/nurse	345 (82.3)	564 (84.8)	1115 (86.2)
Assistance during breastfeeding			
No	164 (39.1)	222 (33.4)	436 (33.7)
Yes	255 (60.9)†	443 (66.6)	858 (66.3)
Mode of delivery			
Vaginal	352 (84.0)	560 (84.2)	1076 (83.2)
Caesarian	67 (16.0)	105 (15.8)	218 (16.9)

INR, Indian rupee; IQR, interquartile range; PHC, primary health center.

* $P < .001$.

† $P < .05$.

‡ $P < .01$.

Table 2. Factors Associated With Delayed Initiation of Breastfeeding Practices Among Women in Rural Southern India

Characteristics	Delayed Initiation of Breastfeeding (n = 281) Adjusted Odds Ratio (95% CI)
Maternal Characteristics	
Maternal age, y	—
Maternal education	
No education	1.00
Primary (1-7 y)	0.73 (0.51, 1.07)
More than primary (>7 y)	0.82 (0. 57, 1.18)
Monthly household income, INR	
≤4000	—
4001-10,000	—
>10,000	—
Parity	
Primigravida	—
Multigravida	—
Characteristics of birth	
Antenatal checkups, n	
≤4	1.00
5-6	0.94 (0.61, 1.46)
7-10	0.59 (0.41, 0.87)*
>10	1.18 (0.44, 3.21)
Birth attendant	
Doctor/nurse	—
Traditional birth attendant (TBA)	—
Relative	—
Auxiliary nurse midwife (ANM)	—
Place of delivery	
Maternity/private nursing home	—
Home	
Subcenter/PHC/district health	—
Type of delivery	
Vaginal	1.00
Caesarian	1.05 (0.93, 1.18)
Assistance during breastfeeding	
Yes	1.00
No	0.73 (0.57, 0.95)†
Infant Characteristics	
Infant gender	
Male	—
Female	—
Gestational age	
Term	—
Preterm	—
Birth weight, kg	—
Happy with infant gender	
Yes	1.00
No	1.42 (1.00, 2.00)†

Note: Multivariate analysis was adjusted for the following independent covariates: maternal education, number of antenatal visits, type of delivery, and assistance during breastfeeding. CI, confidence interval; INR, Indian rupee; PHC, primary health center.

* $P < .01$.

† $P < .05$.

Table 3. Factors Associated With Nonexclusive Breastfeeding Practices Among Women in Rural Southern India

Characteristics	Nonexclusive Breastfeeding (n = 675) Adjusted Odds Ratio (95% CI)
Maternal Characteristics	
Maternal age, y	0.95 (0.92, 1.00)*
Maternal education	
No education	1.00
Primary (1-7 y)	1.94 (1.35, 2.79)†
More than primary (>7 y)	1.58 (1.10, 2.26)‡
Monthly household income, INR	
≤4000	—
4001-10,000	—
>10,000	—
Parity	
Primigravida	—
Multigravida	—
Antenatal checkups, n	
≤4	1.00
5-6	0.88 (0.57, 1.36)
7-10	0.65 (0.45, 0.94)*
>10	0.42 (0.15, 1.17)
Birth attendant	
Doctor/nurse	—
Traditional birth attendant (TBA)	—
Relative	—
Auxiliary nurse midwife (ANM)	—
Place of delivery	
Maternity/private nursing home	—
Home	—
Subcenter/PHC/district health	—
Type of delivery	
Vaginal	—
Caesarian	—
Assistance during breastfeeding	
Yes	—
No	—
Infant Characteristics	
Infant gender	
Male	—
Female	—
Term	
Term	
Preterm	—
Birth weight, kg	—
Happy with infant gender	
Yes	–
No	–

Note: Multivariate analysis was adjusted for the following independent covariates: maternal age, maternal education, and number of antenatal checkups. CI, confidence interval; INR, Indian rupee; PHC, primary health center.

* $P < .05$.

† $P < .001$.

‡ $P < .01$.

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primary education (AOR 1.94, 95% CI: 1.35, 2.79) compared with mothers with no education. Women who had 7-10 antenatal checkups had lower odds of practicing nonexclusive breastfeeding compared with women who had 4 or fewer antenatal visits (AOR 0.65, 95% CI: 0.15, 1.17).

DISCUSSION

Initiation of breastfeeding within the first hour of life and exclusive breastfeeding for an infant's first 6 months are associated with decreased risk of neonatal mortality, sepsis, and other infection. India's 2017 National Health Policy goals include the reduction of the neonatal mortality rate from 28 per 1000 live births to 16 per 1000 live births by 2025[10] and are aligned with the WHO Sustainable Development Goals for reducing neonatal mortality. The aim of this study was to understand the factors associated with suboptimal breastfeeding, information that could contribute to the development effective interventions for increasing rates of early and exclusive breastfeeding practices among this population of rural south Indian mothers.

Our results revealed that a large number of mothers practiced suboptimal breastfeeding (66%), with approximately 1 in 3 delaying breastfeeding and 1 in 2 practicing nonexclusive breastfeeding. In our sample, the percentage of woman who delayed breastfeeding was lower than the national average (59.5%), whereas the rate for exclusive breastfeeding in our sample was about equal to the national average (53.6%).[11] The large percentage of preterm births (44.6%) in this setting is particularly concerning and makes addressing suboptimal breastfeeding an urgent priority. These findings are consistent with previous studies related to breastfeeding practices in rural and low-resource regions.

In the present study, frequency of antenatal visits was a predictor of suboptimal breastfeeding. Mothers with fewer than 7-10 antenatal visits were more likely to delay initiation of breastfeeding and practice nonexclusive breastfeeding. These findings are consistent with prior studies conducted in India. Kamath et al[12] reported that doctors and nurses encouraged mothers to breastfeed during antenatal visits, supporting the association we found between number of antenatal checkups and lower rates of delayed and nonexclusive breastfeeding. The difference in breastfeeding practices may be attributed to greater exposure to breastfeeding education through antenatal visits and thus greater knowledge of the benefits breastfeeding.

We found that maternal education was associated with lower odds of nonexclusive breastfeeding. The association between higher levels of education and breastfeeding rates is well documented, though the causal links between education and optimal breastfeeding practices are unknown. Cleland and van Ginneken[13] have asserted that education is a complex factor that confers social and economic advantages such as higher income, access to health services, better housing quality, and so on. Our findings support these assertions. In this population, mothers with higher levels of education may have greater exposure to reproductive health education or social networks with whom to share information about pregnancy and breastfeeding. We did not find a significant association between maternal education and delayed initiation of breastfeeding, which appear to be influenced by more immediate characteristics such as assistance with breastfeeding and satisfaction with infant gender.

Receiving assistance with breastfeeding was associated with lower odds of delayed breastfeeding but not exclusive breastfeeding. Generally, studies in India have reported a positive correlation between breastfeeding assistance after delivery and optimal breastfeeding practices.[14-16] Postnatal breastfeeding assistance may offer an effective intervention for promoting optimal breastfeeding practices. Future research should examine how postnatal breastfeeding education can be improved to address low rates of exclusive breastfeeding.

Surprisingly, we found no association between suboptimal breastfeeding practices and birth characteristics such as mode of delivery, birth attendant, and place of delivery in the adjusted models. A meta-analysis of 14 breastfeeding studies worldwide found significant delays in initiation of breastfeeding after cesarean delivery.[17] With cesarean deliveries on the rise, it is increasingly important to provide mothers with education on the benefits of breastfeeding within the first hour birth. Other studies of breastfeeding in India found that location of delivery and birth attendant were important predictors in promoting optimal breastfeeding practices.[18] Because of the low variation in delivery characteristics, our study may not have had the statistical power to detect differences.

The strengths of this study are in the prospective cohort design and large sample size, which allowed us to examine sociodemographic and delivery characteristics associated with strong statistical power and minimal recall bias. However, this study is not without limitations. The cohort of mother-infant dyads was recruited from a single region in rural southern India; thus, results may not be generalizable to other areas. Information on exclusive breastfeeding and initiation of breastfeeding were collected based on maternal recall, which we did not confirm by direct observation. In addition, the rates of exclusive breastfeeding and early initiation may be overestimated as a

result of information bias because the mothers were familiar with the interviewers and may have provided responses that are socially desirable. This study did not assess several factors found to significantly affect initiation and exclusivity of breastfeeding, such as breastfeeding problems of mothers, previous reproductive history (eg, number of abortions and neonatal deaths), feeding preference of family members, and feeding practices of friends.[4]

CONCLUSION

Our results revealed that the rate of suboptimal breastfeeding practices is worrisome given the large number of preterm births and high rates of neonatal malnutrition in India. Sociodemographic and support characteristics such as maternal education, frequency of antenatal checkups, and postnatal assistance with breastfeeding were significant predictors of breastfeeding practices. In light of these findings, strategies to improve breastfeeding should target mothers with lower levels of education and few antenatal visits, as well as those mothers unsatisfied with the gender of their baby. Future research should explore the role of delivery characteristics on breastfeeding practices such as birth attendant, location of birth, and mode of delivery among this population of mothers in rural Mysore.

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