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Original Article

Maternal Perceptions About Breast-milk Production Predicted the Daily Frequency of Breastfeeding in Infants of Age Up-to Six Months in Gondar Town, Northwest Ethiopia

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ABSTRACT

Aim: The proper quantity and quality of breast-milk availability markedly influenced by the number of breastfeeding (BF) sessions per day. Consistent professional support that is information based may be crucial in improving the frequency of effective BF. Thus, we aimed to provide information on factors predicting maternal BF frequency (BFF).

Materials and Methods: A total of 861 participants were selected by using a cluster sampling method and a community based cross-sectional study design. An Online Data Collection Kit (ODK) technique was applied to collect the face-to-face interviewer administered survey from lactating women. Advanced analyses were carried out. The directly downloaded data from Google Cloud imported to Stata 14. Negative Binomial Regression was employed to model the frequency of BF and its predictors.

Results: Around 77% of mothers breastfed their infants at least 9 times per day, of which 15% of the mother's breastfed more than 12 times per day. The incidence of frequent BF increased among mothers who had postnatal follow-up [Adjusted Incidence Rate Ratio (AIRR): 1.07; 95% confidence interval (CI): 1.01-1.13], who strongly perceived the adequacy of their breast milk production (AIRR: 1.22; 95% CI: 1.04-1.44) and who had preterm births (AIRR: 1.06; 95% CI: 1.02-1.13). Furthermore, a one-centimetre increase in Mid Upper Arm Circumference (MUAC) of the mothers was associated with an increased frequency of BF (AIRR: 1.02; 95% CI: 1.02-1.03).

Conclusion: The ratio of lactating mothers who breastfeed their infants was found to be lower than the Ethiopia Infant and Young Child Feeding Practice guideline. The incidence rate ratio of frequent BF was directly associated with antenatal MUAC, postnatal follow-up, preterm birth, and maternal perception about breast milk production. Though BFF is one of the components of appropriate BF, this issue has received little attention in Ethiopia. Thus, frontline health professional and concerned bodies should give attention to the encouragement of the frequency of BF by giving attention to its identified predictors.

Keywords: Frequency of breastfeeding, infants aged up to six months, Ethiopia, poisson regression

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Introduction

In Ethiopia, the proportion of mothers initiating exclusive breastfeeding (EBF) has increased between the years 2005 and 2019 from 49% to 59% (1). However, EBF is frequently discontinued before 6 months (1,2), despite current recommendations that infants should be exclusively breastfed "on-demand" (according to their appetite) until the age of 6 months of life (1,3). The proportion of exclusively breastfed infants in Ethiopia abruptly drops with age; from 73% to 68% between the ages of 0-1 months and 2-3 months, and further to 40% at the age of 4-5 months (1). The frequently given reasons for this discontinuation is the perceived insufficient milk production (4-6), in other words, a woman perceiving that her supply is inadequate either to satisfy her infant's hunger or to support normal growth (7). The volume of milk consumed at each BF is directly related to the available milk volume of the breast (8). Indeed, the proper quantity and quality of breast-milk availability markedly influenced the number of BF sessions per-day (9).

Thus, exclusive BF and BF duration are correlated issues as artificial feeding during the first few days and weeks of lactation reduces the frequency of breast stimulation required to form breast tissue development and milk production (10). Artificial or formula milk is likely used by mothers who perceive that they have insufficient milk production. BF knowledge is strongly linked with BF confidence and actual lactation duration (5). Several previous studies have testified that BFF falls between the range of eight to twelve times per day (6,8,11-13).

Consequently, evidence-based information can assist efforts to improve the frequency of successful BF by replacing either unskilled or inconsistent professional support. We aimed to provide information that can be used as a guide to clinicians or frontline health workers on those factors affecting BFF.

Materials and Methods

Study Design and Setting

A community-based cross-sectional study was employed to reach lactating mothers who were living in Gondar Town. From the Amhara National Regional State administrative zones. Gondar town is located in the Northern part of it at a distance of 747 km from Addis Ababa (the largest city and capital of Ethiopia). It has 12 counties with a total population of 333,103 (14,15). The town has one governmental referral hospital, more than eight health centres, and more than 15 private medical clinics (16). Lactating women who were living in a randomly selected urban county (clusters) were considered as the study population.

Sample Size

A cluster sampling technique was used to select lactating mothers who had six-month-old infants. At the first stage, a lottery method was applied to find the five urban clusters and at the sec ond stage, a housing census of lactating mothers found in the five selected clusters was conducted. The desired sample size (n) was calculated in Epi-info 7 by the s ingle population proportion formula $n = \frac{\left(z_{\alpha/2}\right)^2}{d^2} pq$ by assuming 95% confidence level of, $z_{a/2} = 1.96$ a margin of error of 5%, design effect of 2, the proportion infants breastfeed more than eight times per 24-hours was 74% (1), and the non-response rate was 10%. The final sample size was 650 but due to a cluster effect, all the participants within the five clusters were included and a total of 861 was finally reached.

Data Collection and the Questionnaire

A face-to-face interviewer administered a structured and pre-tested electronic-based questionnaire to collect the required data from all the participants. The online data collection and management application kit was used (17). A Lenovo-7 tablet with uploaded questionnaires was used by nine trained nurses to collect and send the data through an online Google cloud platform. To confirm consistency, the original English version of the questionnaire was translated to Amharic and back-translated to English before the actual data collection. The investigators of the study supervised the overall process of the data collection activities.

Socio-demographic characteristics such as age, educational status, income, marital status, frequency and early initiation of breastfeeding were collected by using a questionnaire. Maternal and infant nutritional status were collected using the Mid Upper Arm Circumference (MUAC) where an infant with a MUAC ≤110 mm and a mother with maternal MUAC ≤220 mm were considered malnourished (18-20). Food security was assessed using a question, "In the last three months, have you ever worried that your household would not have enough food?" with a response category of "yes" or "no". Information on maternal characteristics including pregnancy intention and perception towards breast-milk production (how satisfied they were with the amount of milk they produced for their baby) were collected. Maternal depression was assessed using the Edinburgh Postnatal Depression scale with a cut-off value of 12 or more indicating depression (21). Social support was

assessed using the Oslo Social Support scale with a cut-off value of 9 and above indicating good support (22). Partner support was assessed by a question "My husband helps me a lot" with response options of "always", "most of the time", "some of the time", and "rarely".

Data Analysis

The data, which was stored online on the Google Cloud Platform, was directly downloaded and imported to the Stata 14 for further analysis. The data completeness was checked and further cleaning was done by running frequencies. Before further analyses were done, the nature of the data was explored through mean, median, proportion/percentage, interquartile range, standard deviations, and exploratory analysis. Preliminary findings were presented using tables. The appropriate assumptions were checked (such as equal mean and variance of the corresponding count data) and the Negative Binomial Regression Model was fitted to model factors associated with the BFF. Adjusted incidence rate ratio (AIRR) with its 95% confidence interval (CI) was used to report factors predicting the BFF.

Statistical Analysis

A statistically significant variable was considered at a p-value $\leq$0.05 in the final model. Akaike information criterion (AIC) and Bayesian information criteria (BIC) were applied to select the model with the best fit for the data. The model with the smallest AIC and BIC was selected as the best fit model for the data and interpreted.

Ethical Consideration

The first approval was obtained from University of Gondar Institutional Review Board ethics committee (approval no: O/V/P/RCS/05/1601/2018, date: 12/06/2018). A supportive letter, which was used in Gondar town health office and respective districts, was given by the University of Gondar Research and Community Service. The purpose of the study and its objectives were explained to each participant including their right to participate or not participate in the study. A personal identifier was not used in order to protect the privacy and confidentiality of the study participants. Before the interview started, written informed consent was secured from the study participants declaring that they were willingly participating in the study. Participants who were seriously ill at the time of data collection were referred to Gondar University Specialized Hospital. Lactating mothers and infants found to be severely malnourished were also counselled about proper nutrition.

Results

Baseline Characteristics of the Respondents

A total of eight hundred and sixty-one (861) mothers were interviewed. The mean [± standard deviation (SD)] age of mothers was 26.5 (±4.53) years. Most of the mothers (80.7%) were orthodox Christian followers and married (96.2%). A substantial proportion of respondents (61.6%) had primary or above educational status, while more than two-thirds of the study participants (71%) were housewives. Around 90% of respondents had low or medium-income with a household mean (± SD) monthly income of 3,509.76 (±2977.61 birr) Ethiopian birrs (Table I). Eight hundred and twenty-five (95.8%) and six hundred and sixty-one (76.8%) mothers had attended Antenatal-care or were attending Postnatal-care services, respectively. Regarding pregnancy needs, seven hundred and thirty-four (85.3%) pregnancies were planned and the majority of women had 3 or less children with a mean (± SD) number of 2 (±1.21) children. Over two-thirds (69%) of BF women strongly agreed that their breast milk production was adequate.

Psychosocial Characteristics of the Respondents

Nearly half (47%) of lactating mothers have constant support from their husband. A significant number of (79.7%) the participants received good social support, and the remaining had poor social support. Regarding their depression status, 6% of the mothers had depression symptoms during pregnancy and 8% of lactating mothers had depression. Daily coffee consumption was reported in 41.2% of lactating mothers.

Baseline Characteristics of the Infant

The majority (68.9%) of the infants included in the current study were above the age of four months. About 61% of infants had initiated breastfeeding within one hour of delivery and a similar proportion (63%) of infants had exclusive BF for up to 6 months. About 15% and 3% of infants were preterm births or low birth weight, respectively. One hundred and twenty-two (14%) of the infants were malnourished. About 22% and 17% of the infants had diarrhea or acute respiratory infection, respectively (Table II).

Predictors of Breastfeeding Frequency Among Lactating Mothers

Among the 861 participating lactating mothers, about 77% reported breastfeeding their infants at least 9 times per day (in 24 hours). Of these, around 15% of mothers frequently breastfed their children more than twelve times per day. An adjusted Poisson regression model output

Table I. Baseline-characteristics of the respondent in Gondar tow, Northwest Ethiopia (n=861)

Variable	Number	%
Age of Respondents		
18-24	280	32.52
25-34	521	60.51
≥=35	60	6.97
Religion of Respondents		
Orthodox	695	80.72
Muslim	166	19.28
Marital Status of Respondents		
Single	33	3.83
Married	828	96.17
Educational Level of Respondents		
No formal education	110	12.78
Grade 1-8	221	25.67
Grade 9-12	321	37.28
Diploma and above	209	24.27
Occupation of Respondents		
Housewife	614	71.31
Student	13	1.51
Government employee	123	14.29
Self-employed	111	12.89
Income of Respondents		
Low	419	48.66
Medium	353	41.00
High	89	10.34
ANC Follow-up		
No	36	4.18
Yes	825	95.82
PNC Follow-up		
No	200	23.23
Yes	661	76.77
Parity		
1	331	38.44
2-3	433	50.29
4-8	97	11.27
Sex of Child Preference		
No	626	72.71
Yes	235	27.29
Pregnancy Planning		
Planned	734	85.25
Unplanned	127	14.75
Breast Milk Production Perception of Respondents		
Don't know	18	2.09
Agree	248	28.80
Strongly agree	595	69.11
Antenatal-MUAC		
<22 cm	123	14.29
>22 cm	738	85.71
Postnatal-MUAC		
<22 cm	71	8.25
>22 cm	790	91.75

MUAC: Mid Upper Arm Circumference, ANC: Antenatal care, PNC: Postnatal care

Table II. Baseline characteristics of infants under the age of six months in Gondar town, Northwest Ethiopia (n=861)

Variables	Number	%
Age of Infant		
1-4 months	268	31.13
5-6 months	593	68.87
Early Initiation of BreastFeeding		
No	332	38.56
Yes	529	61.44
Exclusive BreastFeeding		
No	316	36.70
Yes	545	63.30
Low Birth Weight		
No	835	96.98
Yes	26	3.02
Preterm Birth		
No	733	85.13
Yes	128	14.87
Infant Nutritional Status		
Normal	739	85.83
Malnutrition	22	14.17
Diarrhea		
No	714	82.93
Yes	147	17.07
Acute Respiratory Infection		
No	675	78.40
Yes	186	21.60

revealed that the incidence of frequent breastfeeding increased among lactating mothers who had postnatal follow-up (AIRR: 1.07; 95% CI: 1.01-1.13), who strongly agreed that their breast milk production was adequate (AIRR: 1.22; 95% CI: 1.04-1.44), and who had preterm births (AIRR: 1.06; 95% CI: 1.02-1.13). A one-centimetre increase in MUAC of the mothers was found to be associated with an increase in EBF (AIRR: 1.02; 95% CI: 1.02-1.03) (Table III).

Discussion

Inappropriate breastfeeding practices significantly impair the health, development and survival of infants and improving these practices could save thousands of infant lives each year (2). The first few hours and days of a newborn's life are a critical window for establishing lactation through the early initiation of BF, EBF, and an increased frequency of breastfeeding. The current study aimed to provide information that can be used as a guide to clinicians or frontline health workers when advising mothers about proper breastfeeding.

Most (77%) of the mothers reported breastfeeding their infants at least 9 times per day (in 24 hours), which is similar to a study from Southern Ethiopia with a rate of 74% and Addis Ababa city with a rate of 76% (23,24). The Ethiopia IYCF guideline recommends lactating women breastfeed infants at least 10-12 times per day (25). With respect to this, only 58% achieved this recommendation. In addition, early initiation of breastfeeding and EBF were 61% and 63% respectively, which are also below the recommended IYCF guideline (3). Compared to the current study, lower BFF was reported in Indonesia with a rate of 53.6% (13). These possible differences might be due to socio-demographic differences such as maternal education or employment status. Highly educated mothers are more

Table III. Poisson regression model to identify factors associated with BFF among lactating mothers in XX, 2019 (n=861)

Variables	**Frequency (%)**	**IRR, 95% CI**	**AIRR, 95% CI**
Antenatal MUAC	861 (100%)	1.03 (1.02-1.04)	1.02 (1.002-1.03)*
Postnatal MUAC	861 (100%)	1.02 (1.01-1.04)	1.00 (0.98-1.02)
PNC Follow-up			
No	200 (23.23)	1	1
Yes	661 (76.77)	1.14 (1.08-1.20)	1.07 (1.01-1.13)*
Preterm Birth			
No	733 (85.13)	1	1
Yes	128 (14.87)	1.09 (1.04-1.16)	1.06 (1.02-1.13)*
Breast Milk Production Perception of Mothers			
Don't know	18 (2.09)	1	1
Agree	248 (28.80)	1.09 (0.93-1.29)	1.11 (0.94-1.31)
Strongly agree	595 (69.11)	1.24 (1.06-1.45)	1.22 (1.04-1.44)*
Husband Support			
Rarely	52 (6.04)	1	-
Some of the time	160 (18.58)	1.07 (0.97-1.18)	1.07 (0.97-1.19)
Most of the time	247 (28.69)	1.05 (0.95-1.16)	1.07 (0.97-1.19)
Always	402 (46.69)	1.13 (1.03-1.24)	1.09 (0.99-1.21)
Days With Disability of Mothers			
≤=7days	416 (48.32)	1	-
≥=8days	445 (51.68)	1.07 (1.03 - 1.12)	1.04 (0.89 - 1.09)
Postnatal Depression			
No	69 (8.01)	1	-
Yes	792 (91.99)	0.95 (0.88-1.03)	0.97 (0.89-1.06)

BFF: Breastfeeding frequency, MUAC: Mid Upper Arm Circumference, IRR: Incidence rate ratio, AIRR: Adjusted incidence rate ratio, CI: Confidence interval

likely to be employed and might not have time to frequently breastfeed, unlike those who are less educated and are often housewives. Most of the participants in the current study were housewives with a low educational status. This shows the negative effect of employment on the frequency and duration of breastfeeding (26), and most importantly EBF (25).

In Southeast Ethiopia, the median BFF was found to be 6 times per day (27). This is lower than our finding and this might be due to the age difference of the infants (25,28) included in the study as BFF decreases as the age of the infants' increases (27,28). In the first month, there is frequent breastfeeding with a short duration (lasting for 20 minutes) but, in later months, this frequency gradually decreases while the duration of breastfeeding increases (12,29).

A unit increase in the antenatal MUAC of the mothers resulted in an incremental increase in BFF in this study. Opposing this, a finding from Bangladesh showed that maternal nutritional status was found to be unrelated to the frequency of breastfeeding (6). In general, a previous review (30) and cohort study (31) found an association between maternal weight and the main breastfeeding components. Thus, optimizing maternal BMI during the pre-conception period is essential, which is supported by the current findings indirectly. Unlike our findings where no association between infant nutritional status and the incidence rate ratio of BFF was determined, a study from Bangladesh stated that infant nutritional status was significantly associated with BFF (6).

In this study, mothers who had postnatal follow-up were more likely to frequently breastfeed their infants than their counterparts. This is true as postnatal follow-up helps to provide counselling services about appropriate breastfeeding (3). A major review approach for improving BF rate noted multiple determinants and influences but BF counselling is one of the key interventions to improve the BF rate (32). The incidence rate ratio of BFF was found to be higher among mothers who had preterm birth infants. Better counselling and support about appropriate breastfeeding to mothers of preterm infants might have enhanced their knowledge and practice on the frequency of BF. This evidence implies that the implementation of some breastfeeding counselling, such as about frequency and timing, to the lactating mothers could significantly improve breastfeeding practices.

Similarly, the incidence rate ratio of frequent breastfeeding was higher among mothers who strongly agreed that their breast milk production was enough to feed their infants. Maternal perception about insufficient milk production was found to be one of the reasons for lower BFF and discontinuing BF in another study (6). There is also evidence that, for a mother, the more productive of their breasts was used more frequently than the less productive one, and when the breastfeeding was paired, the more productive breast was offered first more frequently than the less productive one (8). To our knowledge, this investigation is the first to examine BFF in relation to an urban setting. Thus, this finding may serve as baseline information for frontlin e health workers, decision-makers and researchers. However, mothers' recall bias on BF frequency might affect the validity of this study. A prospective follow-up study that is able to observe the duration of BF for each frequent BF with the inclusion of socio-cultural variables would help to determine a more precise estimate.

Conclusion

The ratio of lactating mothers in this study who breastfeed their infants was found to be lower than the Ethiopia IYCF guideline. The incidence rate ratio of frequent breastfeeding was directly associated with antenatal MUAC, postnatal follow-up, preterm birth, and maternal perception about breast milk production. Although BFF is one of the components of appropriate BF, this issue has received little attention in Ethiopia. Thus, frontline health professionals and concerned bodies should give attention to the enhancement of the frequency of BF. In addition, we have also a recommendation to strengthen the public health information and education system in order to promote appropriate breast-feeding.

Ethics

Ethics Committee Approval: The first approval was obtained from University of Gondar Institutional Review Board ethics committee (approval no: O/V/P/RCS/05/1601/2018, date: 12/06/2018).

Informed Consent: Before the interview started, a written informed consent was secured from the study participants to willingly participate in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: A.F.D., Z.M.N., H.D.D., Design: A.F.D., Z.M.N., H.D.D., Data Collection or Processing: A.F.D., Z.M.N., H.D.D., Analysis or Interpretation: A.F.D., Z.M.N., H.D.D., Literature Search: A.F.D., Z.M.N., H.D.D., Writing: A.F.D., Z.M.N., H.D.D.

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