Factors associated with prelacteal feeding practices in Debre Berhan district, North Shoa, Central Ethiopia: a cross-sectional, community-based study

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Abstract

Background: Prelacteal feeding is one of the major harmful newborn feeding practices and is top on the list of global public health concerns. The practice deprives newborns of valuable nutrients and protection of colostrum and exposes them to preventable morbidity and mortality. Studying the prevalence and factors influencing the prelacteal feeding practice of mothers will help program managers and implementers to properly address broad major public health problems. Therefore, this study aims to investigate the prevalence of prelacteal feeding practices and its associated factors among mother-infant dyads in the Debre Berhan district of North Shoa administrative zone, central Ethiopia.

Methods: A community-based cross-sectional study design was conducted from January through to April 2014 among 634 mother-infant dyads. The data were entered into EPI Info version 3.5.1. (CDC, Atlanta, Georgia). All statistical analysis was conducted using Statistical Package for Social Sciences (SPSS) research IBM version 20.0. The prevalence of prelacteal feeding was determined using the ‘recall since birth’ method. Multi-variable logistic regression analysis was employed to control confounders in determining the association between prelacteal feeding practices and selected independent variables. Adjusted Odds Ratio (AOR), with 95% Confidence Interval (CI) and P < 0.05 was used to claim statistical significance.

Results: The prevalence of prelacteal feeding practice was 14.2% (95% CI: 11.00–17.00%). Slightly greater than half, 48 (53.3%) of prelacteal fed newborns were given butter. Home delivery was a major risk factor for practicing prelacteal feeding. Mothers who delivered their indexed infant at home practiced prelacteal feeding over four folds more than mothers who delivered in a health institution (Adjusted Odds Ratio (AOR) 4.70; 95% CI: 2.56–8.60, p-value = 0.001). Mothers who did not initiate breastfeeding within an hour were six times more likely to practice prelacteal feeding (AOR 5.58; 3.21–9.46, p-value = 0.001). Similarly, with regards to the occupation of mothers, farmers practiced prelacteal feedings (AOR 4.33; 95% CI: 1.73–10.81, p-value = 0.002) up to four folds more than their counterpart housewives. Mothers who can read and write are 54% less likely to practice prelacteal feeding than their counterpart, illiterate mothers, with (AOR 0.46; 95% CI: 0.22–0.98, p-value = 0.044).

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Introduction
During the last two to three decades, more specifically during the life of the Millennium Development Goals (MDGs), from 1990 to 2015, there have been advancements made globally in improving child survival rates. In 2013, the world witnessed the decline of under-five deaths by more than half from the baseline figure i.e. from 12.7 million to 6.3 million [1], 2 years ahead of the set deadline. To ensure the sustainability of these gains, 180 countries have pledged to further reduce maternal, neonatal and child deaths [1]. Moreover, there will be more effort in the coming years to enhance these gains as part of achieving the Sustainable Development Goals (SDGs) set to be achieved by 2030, as infant feeding practices are a component of the second sustainable goal, ‘zero hunger’; and the third sustainable goal of ‘good health and wellbeing for people’. In addition, the effect of breastfeeding on intelligence which includes human capital is relevant to the fourth goal, ‘quality education’, the first goal, ‘no poverty’, and the eighth goal ‘decent work and economic growth’. Finally, by helping to bridge the gap between rich and poor, breastfeeding can contribute to the tenth sustainable goal of ‘reducing inequalities’ [2].

Breast milk is the ideal nourishment for babies during the first 6 months of life. It contains all the necessary nutrients, antibodies, and hormones that a baby needs to thrive. Therefore, the World Health Organization (WHO) recommends early initiation of breastfeeding for newborns preferably within 1 h of birth [3]. Smith et al. (2017) attest that early initiation of breastfeeding protects newborns from infections and reduces newborn mortality [4]. However, recent systematic reviews have documented that globally, only about half of women who give birth begin breastfeeding within the first hour of life [5]. In addition, studies show that in many countries the harmful feeding practice of prelacteal feeding, is often a norm.

According to Mukuria et al. (2006), prelacteal feeding is defined as “giving liquids or foods other than breast milk prior to the establishment of regular breastfeeding” [6]. Newborn feeding practices, specifically among harmful traditional practices, prelacteal feeding practices assume top position on the list of global public health concerns. In Ethiopia, among the common prelacteal feeds given to newborns are; raw butter, sugar infused with water, plain water and diluted milk other than breast milk [7, 8]. Hence, this practice deprives a newborn child of valuable nutrients and protection of colostrum and exposes a newborn infant to preventable morbidity and mortality [6, 9–11].

This harmful prelacteal feeding practice has been widely documented in almost all administrative regions of Ethiopia. The magnitude of prelacteal feeding practices reported in the whole country ranges 15 to 45.5% [7, 8, 10–14]. The predictors of prelacteal feeding practices were found to be: socio-demographic characteristics, Ante-Natal Care, place of delivery, Post-Natal Services and counseling services received on infant feeding and early initiation of breastfeeding [7, 8, 10–13].

During the last two decades, the Federal Ministry of Health developed and implemented the Infant and Young Child Feeding (IYCF) strategy [15]. One of the main interventions implemented to improve the health of a child is to promote exclusive breastfeeding practices for the first 6 months of life [16, 17]. The national flagship community health program, which is implemented through health extension workers, promotes health through engaging households in taking ownership of their own health issues [18]. In addition, since 2012, community health services have been enhanced through the participatory engagement of a women’s group, the health development army (HDA). The group is responsible for disseminating health information and facilitating the uptake of basic health services [19]. Furthermore, the Health Sector Transformation Plan II (HSTP II 2015/16–2019/20) has set a goal to raise the amount of exclusive breastfeeding practices to 72% by the year 2019 [17]. To achieve this ambitious goal, households will be encouraged and monitored to take up tailored and predefined health promotion, disease prevention, and basic curative interventions. However, considering diversified socio-economic characteristics of the Ethiopian people and the result observed due to the implemented interventions local evidence on prelacteal feeding practices is scarce.

It is important to study newborn feeding practices as a component of optimum breastfeeding practices. Therefore, this study was conducted to assess prelacteal feeding practices and associated factors among mothers of children aged less than 12 months in the Debre Berhan district of North Shoa administrative zone, central Ethiopia. Studying the magnitude and factors influencing
prelacteal feeding practices of mothers will help health care providers, child health program managers and implementers to design tailored interventions to reduce prelacteal feeding and promote exclusive breastfeeding practices.

Methods and materials

Study design and setting

This community-based cross-sectional study was conducted among mother-infant dyads from March to April 2014, in the Debre Berhan district of North Shoa administrative zone within the Amhara region. The study area is located 120 km away from Addis Ababa, the capital city of Ethiopia. The study area has an estimated total population of 84,920 people [20]. The study was conducted in four of nine kebeles the smallest administrative units where 5000 people live per kebele. The data were part of the study conducted to determine factors associated with exclusive breastfeeding practices in Debre Berhan district, central Ethiopia [21].

Sample size and sampling

Data were collected from 634 mother-infant dyads. The sample size was determined using Cochran's formula [22] with its presented assumptions:

\[
ni = \frac{Z^2a^2}{2p(1-p)d^2}
\]

Where ni is the sample size, Z is standard normal variable at 95% confidence level (1.96), \(p\) is (0.50) the proportion of mothers who practiced prelacteal feeding in the study area was not known, \(d\) is the marginal error (0.05), design effect (1.5) and contingency for non-response (0.10). Therefore, \(ni = 576\), considering 10% for refusal and incomplete data \((n = 576 + 58 = 634)\). Based on the assumption of homogeneity of the population, four (2 urban and 2 rural) out of nine kebeles were selected using lottery methods. Following that, a population census was conducted in these kebeles which was used to identify 1177 mother-infant dyads [20]. After developing the sampling frame, study subjects were selected using every other household with systematic random sampling techniques. During data collection, 53 mothers and their index infants were replaced due to incomplete responses and absence of basic information. Mother-infant dyads who lived for more than 6 months in the study area were chosen for the study.

Data collection tool and procedure

Structured and semi-structured questionnaires were adopted from the Ethiopian Demographic and Health Survey (EDHS) [12] and WHO recommended national assessment tools for infant and young child feeding surveys [23] were applied for this study. The questionnaire was first prepared in English, translated into Amharic, and then back into English to check its consistency using fluent speakers of both languages. The final Amharic version of the questionnaire was used to collect the data. Data on socio-demographic characteristics, maternal health service uptake and infant feeding practices were collected using the 'recall since birth' method. The most significant study question asked was, “Before initiation of breastfeeding, was <name of indexed infant> given anything to drink and/or eat other than breast milk?”. The data was then collected through face to face interviews conducted at the study participants’ home. Respondents who were unavailable or absent were revisited.

Study variables

The questionnaires noted the socio-demographic information of the mother-infant dyads and prelacteal feeding practices of mothers for the index infant. In this study, the dependent variable was prelacteal feeding practices. In the regression analysis, prelacteal feeding practice was coded ‘1’ while ‘0’ was coded for non-prelacteal feeding practices. The independent variables considered were: age, educational status, residence, marital status of mothers, household income, occupation, family size, sex of infant, place of delivery and ante-natal and post-natal service utilization. The age of mothers was categorized into three groups i.e. < 25, 25–35 and > 35 years. The younger age group was taken as a reference population in the regression analysis. The religion of mothers was coded as ‘0’ for Christian and ‘1’ for Muslim. Urban and rural residences of mothers were coded as ‘0’ and ‘1’ respectively. Regarding the educational status of parents, those who could not read and write were coded as ‘0’ while the rest were coded as ‘1’. Mothers who were housewives were coded ‘0’ while farmers and employed mothers were coded ‘1’. The lowest household income was coded ‘0’ while the other two levels were coded ‘1’. Mothers who received infant feeding counseling and delivered in a health institution were coded as ‘0’, while those who did not receive those services were coded as ‘1’ [21].

Operational definitions

Prelacteal feeding: is defined as giving liquids or foods other than breast milk prior to the establishment of regular breastfeeding [6].

Early initiation of breastfeeding: are the proportion of children born in the last 24 months who were made to breastfeed within 1 h of birth [3].

Exclusive breastfeeding: are the proportion of infants less than 6 months of age, who are exclusively breastfed with breast milk and no other liquids or solids, with the
exception of oral rehydration solution, supplements or medicines [3].

Health Extension Workers (HEWs): are community level health workers trained for 1 year at undergraduate level to deliver preventive, promotive and curative health services, such as maternal and child health services [24].

Health Development Army: are a network of up to 5 families each of which one of the families, who is an innovator or front liner in practicing health behavior, leads the network and gradually influences the rest of the households to acquire skills and changes in attitudes towards healthy behavior. The network is technically supported by the HEWs, who facilitate and follow up through regular conversations held within the community [24].

Kebele: is the smallest administrative unit with a population of 5000 people [25].

Data quality control
A two-day long training and pretesting were arranged for data collectors and supervisors. Moreover, to maintain the quality of collected data, the questionnaires were pre-tested using 10% of the sample size at the Basona Worana district within North Shoa administrative zone. The data collection tools were amended based on the findings of the pilot test. Supervision was conducted during the actual data collection by the investigators. Every questionnaire was checked for completeness and supervisors were providing feedback on the quality of collected data on a daily basis. In addition, filled in questionnaires were cleaned and coded to double enter into computers by the data encoder.

Data management and analysis procedure
Data were entered using the EPI Info statistical software V.3.5.1(CDC, Atlanta, Georgia, USA) [26] and exported to Statistical Package for Social Science (SPSS) research (SPSS-IBM- version 20) [27] for analysis. Cleaning was conducted using frequencies and univariate analysis. Percentages, frequency distributions and measures of central tendency and measures of dispersion were used for describing the data. The investigators used the ‘recall since birth’ method to determine the magnitude of prelacteal feeding practices among mother-infant dyads in the targeted community. Bivariate logistic regression was computed to identify the association of independent and dependent variables. Finally, based on the recommendations of Bendel and Afiff (1977), independent variables found to have $P$-value $\leq 0.2$ [28] were entered into multivariate logistic regressions to control the effect of confounding. The Hosmer-Lemeshow goodness-of-fit was used to test for model fitness. Results were reported as Crude Odds Ratio (COR) or Adjusted Odds Ratio (AOR) with 95% Confidence Intervals (CIs). The statistical significance test was accepted at $p < 0.05$.

Ethical considerations
Ethical clearance was obtained from the Institute Review Board (IRB) of Debre Berhan University. Permission was granted form both Debre Berhan District Health Office and kebele administrations. Informed consents were obtained from all mothers participating in the study. Participation of all respondents in the survey was strictly voluntary. All information obtained from the respondents was anonymous and confidential.

Results

Socio-demographic characteristics of mother-infant dyads
In this study a total of 634 mother-infant dyads were enrolled, resulting in a response rate of 100%. The mean (±SD) age of the mothers was 30.9 years (±6.20). Slightly higher than one-fourth of mothers, 163 (25.7%) were illiterate respondents. Close to one third 208 (32.8%) of mothers were farmers. The mean age of infants with standard deviation was 7.79 months (±3.23). Slightly higher than half of the children 344 (54.3%) were male. The majority of mothers, 535 (84.4%), delivered their babies in health institutions (Table 1).

Utilization of maternal health service
Five hundred and sixty-seven (89.4%) of mothers had received at least one antenatal care service for the index infant. In addition, the majority (82.6%) of mothers were offered infant feeding counseling services (Table 2).

Feeding practice of mothers
Fourteen-point 2 % (95% CI: 11.00–17.00%) of mothers reported that they had provided prelacteal feed to their indexed infants. Of these, 53.3% provided butter and 40.0% provided a glucose solution made of water and sugar. Four hundred and forty-eight (70.7%) and 506 (79.8%) of mothers had initiated breastfeeding within 1 h and twenty-four hours after delivering their indexed baby, respectively. Two third of infants (68.6%) were exclusively breastfed for their first 6 months of life (Table 3).

Factors reported in association with early initiation of complementary feeding
In the univariate logistic regression analysis; place of residence, age of mothers, educational status of mothers, income of households, place of delivery and infant feeding counseling services were associated with prelacteal feeding practices. Multi-variable logistic regression analysis was computed and four predictor variables of prelacteal feeding practices were identified (Table 4). Home delivery was the major risk factor for practicing
Mothers who delivered their indexed infant at home had practiced prelacteal feeding over four-folds more than mothers who had delivered in a health institution (Adjusted Odds Ratio (AOR) 4.70; 95% CI: 2.56–8.60, p -value = 0.001). Mothers who did not initiate breastfeeding within an hour had practiced prelacteal feeding six-folds more than their counterparts (AOR 5.58; 3.21–9.46, P-value =0.001). Similarly, with regards to the occupation of mothers, farmers were four times more likely to practice prelacteal feedings, than their counterparts, housewives, (AOR 4.33; 95% CI: 1.73–10.81, p -value = 0.002). Mothers who can read and write were 54% less likely to practice prelacteal feeding than their counterparts, illiterate mothers, with, (AOR 0.46; 95%CI: 0.22–0.98, p-value = 0.044).

Discussion
This study found statistically significant association between home delivery, initiation of breast feeding within an hour, occupation and educational status of mothers and prelacteal feeding practices. The identified predictors of prelacteal feeding practices are in line with global and national identified gaps to address through this study, proper and tailored interventions are required so that the district health systems [5, 16].

The study revealed that one-sixth of mothers practice prelacteal feeding. This prelacteal feeding practice prevalence was found in line with the reported prelacteal feeding practice rates Bahir Dar city within the Amhara region at 15%, [13], and 16.8% prevalence rate reported.
in the Dubti town of the Afar regional state. However, the findings were much lower than the national estimate at 28.9% [7], and another reports indicating a prevalence rate of 45.4% in the Hareri region [8]. These variations could be due to differences in the study periods, study design and study participants. Furthermore, this study utilized study participants in central Ethiopia, managed in town administrations, whereas the control studies stated above were analyzed data, collected across whole regions from 576 clusters [7]. Another factor for the differences in findings is that the sampled communities reside in a rural setup with major cultural differences between one another [8, 10, 11].

In the study area, mothers reported to administering three common prelacteal feeds to their infants, namely, raw butter (53.3%), sugar and water solution (40.0%) and diluted cow’s milk (6.7%). This finding was in line with findings in different parts of the country [10, 12]. Mothers who can read and write were 54% less likely to practice prelacteal feeding than their counterpart illiterate mothers. Mothers’ optimum infant feeding practices has a significant positive effect on their behavior during postnatal periods. This finding was in line with Tamiru et al. (2013) who documented that in Jimma Arjo district [29], mothers who were exposed to breastfeeding education practiced optimal child feeding practices. In contrast, the findings contradicted Biks et al. (2015) where the education of a mother did not show statistical significance in relation to optimum breastfeeding practices [30].

The occupation of mothers showed an impact on prelacteal feeding practices. In this study, farmer mothers were up to four folds more likely to practice prelacteal feedings than their counterparts, housewives. This finding was not consistent with a study conducted in the Afar region Liben et al. 2017 [11] and Liben et al. 2016 [31] where housewives were more likely to feed their infant prelacteal feeds. This could be due to differences in study subjects, since in this study, urban and rural residents were enrolled while the other studies were conducted in rural communities.

Another finding indicated that mothers who did not initiate breastfeeding within an hour were more likely to practice prelacteal feeding. This finding was consistent with a study conducted in the Afar region where mothers who initiated breastfeeding after 1 h of delivery were nearly three times more likely to practice prelacteal feeding when compared with women who initiated breastfeeding within an hour [11]. This could be due to the fact that mothers who get the support of skilled birth attendants in health institutions may also be assisted with early initiation of breastfeeding.

Utilization of maternal, neonatal and child health services such as antenatal care, infant feeding counseling and postnatal services were positively associated with the reduction of prelacteal feeding practices in the study area. Mothers who delivered their indexed infants at home had a fourfold increased chance of engaging in prelacteal feeding practices when compared with mothers who delivered in health institutions. This finding was consistent with Legesse et al. (2014) and Bekele et al. (2014) who reported that mothers who delivered at home were from four to seven times more likely to practice prelacteal feedings [8, 10].

Conclusions
One-sixth of mothers still practice prelacteal feeding. Ability to read and write, utilization of institutional delivery and receiving counseling services on infant feeding were the predictors for practicing prelacteal feedings. Therefore, improving access to formal and informal education for mothers, improving access to information on newborn feeding practices and encouraging mothers to deliver their infants in health institutions are recommended.
Table 4  Factor associated with pre-lacteal feeding practices of mothers with infants aged less than 12 months in Debre Berhan district, April 2014. Presents candidate and predictor variables of prelacteal feeding practices of mothers. The results are presented with Cruds odds ratio, Adjusted odds ratio and 95% Confidence intervals and p- values

| Characteristics                      | Pre-lacteal feeds | Crude odds ratio (95% CI) | Adjusted odds ratio (95% CI) | p-value |
|--------------------------------------|-------------------|---------------------------|------------------------------|---------|
|                                      | Yes               | No                        |                              |         |
|                                      | N (%)             | N (%)                     |                              |         |
| Place of residence                   |                   |                           |                              |         |
| Urban                                | 35 (38.9%)        | 282 (51.8%)               | 1                            | 1       |
| Rural                                | 55 (61.1%)        | 262 (48.2%)               | 1.69 (1.07, 2.66)            | 0.62 (0.31, 1.25) | 0.18   |
| Religion                             |                   |                           |                              |         |
| Christian                            | 86 (95.5%)        | 465 (85.5%)               | 1                            | 1       |
| Muslim                               | 4 (4.5%)          | 79 (14.5%)                | 0.40 (0.14, 1.14)            | 0.63 (0.18, 2.16) | 0.46   |
| Age of mother (year)                 |                   |                           |                              |         |
| < 25                                 | 17 (18.9%)        | 91 (16.8%)                | 1                            | 1       |
| 25–35                                | 52 (57.8%)        | 301 (55.3%)               | 0.92 (0.51, 1.67)            | 1.67 (0.77, 3.60) | 0.187  |
| > 35                                 | 21 (33.3%)        | 152 (27.9%)               | 0.74 (0.37, 1.47)            | 1.15 (0.48, 2.77) | 0.741  |
| Educational status of mother         |                   |                           |                              |         |
| Unable to read and write             | 33 (30.3%)        | 130 (23.8%)               | 1                            | 1       |
| Read and write                       | 23 (31.7%)        | 157 (28.9%)               | 0.57 (0.32, 1.03)            | 0.46 (0.22, 0.98) | 0.044  |
| Elementary school completed          | 18 (15.6%)        | 87 (16.0%)                | 0.81 (0.43, 1.53)            | 1.53 (0.65, 3.61) | 0.325  |
| High school completed                | 9 (14.5%)         | 94 (17.3%)                | 0.37 (0.17, 0.82)            | 1.51 (0.50, 4.56) | 0.460  |
| Graduate                             | 7 (7.8%)          | 76 (14.0%)                | 0.36 (0.15, 0.86)            | 2.14 (0.53, 8.64) | 0.282  |
| Educational status of husband        |                   |                           |                              |         |
| Unable to read and write             | 17 (18.8%)        | 43 (7.9%)                 | 1                            | 1       |
| Read and write                       | 36 (40.3%)        | 137 (25.2%)               | 0.66 (0.34, 1.30)            | 1.77 (0.71, 4.41) | 0.218  |
| Elementary school completed          | 14 (15.5%)        | 92 (17.0%)                | 0.38 (0.17, 0.85)            | 0.85 (0.30, 2.45) | 0.773  |
| High school completed                | 10 (14.5%)        | 112 (20.6%)               | 0.22 (0.09, 0.53)            | 1.00 (0.30, 3.26) | 0.997  |
| Graduate                             | 13 (14.4%)        | 160 (29.4%)               | 0.20 (0.09, 0.45)            | 1.14 (0.30, 4.30) | 0.847  |
| Current work status of mothers       |                   |                           |                              |         |
| Housewife                            | 12 (13.3%)        | 113 (20.7%)               | 1                            | 1       |
| Working/employed                     | 17 (18.8%)        | 231 (42.5%)               | 0.93 (0.32, 1.50)            | 0.62 (0.22, 1.69) | 0.352  |
| Farmer                               | 61 (67.7%)        | 200 (36.7%)               | 2.87 (1.48, 5.56)            | 4.33 (1.73, 10.81) | 0.002  |
| Household income                     |                   |                           |                              |         |
| Less than 30USD                      | 38 (42.2%)        | 179 (33.06%)              | 1                            | 1       |
| 30–60 USD                            | 29 (32.2%)        | 146 (26.8%)               | 0.93 (0.55, 1.59)            | 1.28 (0.65, 2.50) | 0.468  |
| Greater than 60 USD                  | 23 (25.69%)       | 219 (40.2%)               | 0.49 (0.28, 0.86)            | 1.19 (0.52, 2.70) | 0.678  |
| Counselling on Infant feeding        |                   |                           |                              |         |
| Yes                                  | 57 (63.3%)        | 467 (85.8%)               | 1                            | 1       |
| No                                   | 33 (36.6%)        | 77 (14.2%)                | 3.51 (2.14, 5.74)            | 1.60 (0.85, 3.01) | 0.143  |
| Place of delivery                    |                   |                           |                              |         |
| Health Institution                   | 50 (55.5%)        | 485 (89.1%)               | 1                            | 1       |
| Home                                 | 40 (44.5%)        | 59 (10.9%)                | 6.57 (4.00, 10.79)           | 4.70 (2.56, 8.60) | 0.000  |
| Breastfeeding initiation time        |                   |                           |                              |         |
| Less or equal to 1 h                 | 441 (76.3%)       | 33 (36.7%)                | 1                            | 1       |
| Greater than 1 h                     | 129 (23.7%)       | 57 (63.3%)                | 5.57 (3.46, 8.90)            | 5.58 (3.21, 9.69) | 0.000  |

*aStatistically significant variables at \( p < 0.05\), CI Confidence Interval. Hosmer-Lemeshow goodness-of-fit = 0.273
Abbreviations
AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; HSTP: Health Sector Transformation Plan; IYCF: Infant and Young Child Feeding; MDGs: Millennium Development Goals; SD: Standard Deviation; SDGs: Sustainable Development Goals; WHO: World Health Organization

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Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors’ contributions
The authors’ responsible were as follows; MDA, MMA, MBA, BFD, TRM, KDG, AHF, ADM, AYD; MMA, MDA & MBA: designed the research. MIA & MBB supervised the data collection and ensure the quality of collected data. MDA, MMA, MBA, BFD, TRM, KDG, AHF, ADM & AYD analyzed, interpreted the findings and drafted the manuscript. MDA the corresponding author submitted the paper for publication. All authors reviewed the manuscript and approved the final version for submission.

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Ethics approval and consent to participate
The research protocol of this community-based cross-sectional study was reviewed, and ethical clearance was obtained from the institutional review board (IRB) of Debre Berhan University. An official letter of permission was submitted to Debre Berhan district and kebele administrations. Written informed consent was obtained from all study participants after providing brief explanations about the purpose and procedure of the study. To maintain the confidentiality of collected data, anonymity was maintained throughout the research process. Furthermore, the right to withdraw from participation at any time was respected.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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References
1. United Nations Children Fund (UNICEF). Committing to Child Survival: A Promise Renewed Progress Report 2014. New York: UNICEF; 2014. http://files.unicef.org/publications/files/APR_2014_web_15Sep14.pdf.
2. United Nations. Open working group on sustainable development goals; proposal of the open working group on sustainable development goals. New York: United Nations; 2014.
3. World Health Organization (WHO). Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. Geneva: WHO; 2009.
4. Smith SR, Hurt L, Chowdhury R, Fawzi W, Edmond KM. Neovita study group. Delayed breastfeeding initiation and infant survival: a systematic review and meta-analysis. PLoS One. 2017;12(7):e0180722.
5. Victora CG, Bah R, Barros AJD, França GVA, Horton S, Krasevec J, Murch S, Sankar MJ, Walker N, Rollins NC. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. Lancet. 2016;387(10017):475–90.
6. Mekuria AG, Kothari MT, Abdenaim NH. Infant and young child feeding update. Calverton: ORC Macro; 2006.
7. Belachew AB, Kahsay AB, Abebe YG. Individual and community-level factors associated with introduction of prelacteal feeding in Ethiopia. Arch Public Health. 2016;74(1):6.
8. Bekele Y, Mengistie B, Mesfin F. Prelacteal feeding practice and associated factors among mothers attending immunization clinic in Harari region public health facilities, eastern Ethiopia. Open J Prev Med. 2014;4(07):529.
9. World Health Organization (WHO). Infant and Young Child Feeding: A tool for assessing National Practices, policies and Programmes. Geneva: World Health Organization; 2003.
10. Legesse M, Demena M, Mesfin F, Hailu D. Prelacteal feeding practices and associated factors among mothers of children aged less than 24 months in Raya kobo district, north eastern Ethiopia: a cross-sectional study. Int Breastfeed J. 2014;9(1):189.
11. Liben ML, Wuneh AG, Zepro NB, Mulugeta A. Factors associated with prelacteal feeding in Afar regional state, northeastern Ethiopia: a cross-sectional study. Int J Res – Granthaalayah. 2017;5(7):116–27 doi:10.5281/zenodo.835514.
12. Central Statistical Agency [Ethiopia] and ICF International. Ethiopian demographic and health survey (EDHS) 2011. Addis Ababa and Calverton: Central Statistical Agency and ICF International; 2012.
13. Demirew YM, Tafere TE, Abinet DB. Infant and young child feeding practice among mothers with 0–24 months old children in slum areas of Bahir Dar City, Ethiopia. Int Breastfeed J. 2017;12(1):126.
14. Chea N, Asefa A. Prelacteal feeding and associated factors among newborns in rural Sidama, South Ethiopia: a community based cross-sectional survey. Int Breastfeed J. 2018;13(1):7.
15. Federal Ministry of Health. National strategy for Infant and Young Child Feeding (IYCF). Ethiopia: Family Health Department; Federal Ministry of Health; 2004.
16. Federal Ministry of Health. National Strategy for Child Survival in Ethiopia. Addis Ababa: Family Health Department, Federal Ministry of Health; 2005.
17. Ministry of Health of Ethiopia. Health sector transformation plan. Addis Ababa: Ministry of Health of Ethiopia, 2015.
18. Ministry of Health of Ethiopia. Health Extension Program in Ethiopia. http://www.moh.gov.et/en_GB/web/guest/health-extension-and-primary-health-service. Accessed 15 Dec 2015.
19. Admasu K, Balcha T, Getahun H. Model villages: a platform for community-based primary health care. Lancet Glob Health. 2016;4(2):e78–9.
20. Debre Berhan District Health Office. Annual review meeting report. Debre Berhan: Debre Berhan District Health Office; 2005. EFY (2012/2013 G.C)
21. Asfaw MM, Argaw MD, Kefene ZK. Factors associated with exclusive breastfeeding practices in Debre Berhan District, Central Ethiopia: a cross-sectional community-based study. Int Breastfeed J. 2015;10(1):23.
22. Bartlett JE, Kotrlik JW, Higgins CC. Organizational research: determining appropriate sample size in survey research. Inf Technol Learn Perform J. 2001;19(1):43–50.
23. World Health Organization (WHO). Indicators for assessing infant and young child feeding practice: Part I. Definitions. Washington D.C: Conclusions of a consensus meeting held 6–8 November 2007, 2008. http://whqlibdoc.who.int/publications/2008/9789241596664_eng.pdf?ua=1.
24. Argaw H. The health extension program of Ethiopia. Summary of concepts, progress, achievements and challenges. Addis Ababa: WHO Country Office of Ethiopia; 2007.
25. Bekele T, Raschert F, Asfaha Y, Berhe A, Damme WV. Disease control program contribution to health system strengthening: good practice and new approaches for scale-up. Addis Ababa. Antwerp: Federal Ministry of Health of Ethiopia and the Institute of Tropical Medicine; 2011.
26. CDC Epi Info. Epi Info™ V.3.5.1. 2008. Available: http://www.cdc.gov/epiinfo. Accessed 26 Oct 2018.
27. SPSS, Inc. IBM SPSS statistics base 20. Chicago: SPSS Inc; 2011.
28. Bendel RB, Afifi AA. Comparison of stopping rules in forward regression. J Am Stat Assoc. 1977;72(357):46–53.
29. Tamiru D, Aragu D, Belachew T. Survey on the introduction of complementary foods to infants within the first six months and associated factors in rural communities of Jimma Arjo. Int J Nutr Food Sci. 2013;2(2):77–84.
30. Biks GA, Tariku A, Tessema GA. Effects of antenatal care and institutional delivery on exclusive breastfeeding practice in Northwest Ethiopia: a nested case-control study. Int Breastfeed J. 2015;10(1):30.
31. Liben ML, Yesuf EM. Determinants of early initiation of breastfeeding in Amhara district, Northeastern Ethiopia: a community based cross-sectional study. Int Breastfeed J. 2016;11(1):1.