

Antenatal and perinatal healthcare delivery associations with Infant and Young Child Feeding (IYCF) breastfeeding practice in Nepal: a population-based cross-sectional study

Breanna Louise Hollow

School of Medicine, The University of Notre Dame, Australia, Box 1225, Fremantle, Western Australia 6959

Max K. Bulsara

Institute for Health Research, The University of Notre Dame Australia, PO Box 1225, Fremantle, Western Australia 6959

Prakash Dev Pant

Monitoring and evaluation consultant, Kathmandu, Nepal

Hilary Jane Wallace (✉ hilary.wallace@uwa.edu.au)

School of Population and Global Health, The University of Western Australia, 35 Stirling Highway, Crawley, Western Australia, 6009

Research Article

Keywords: Infant and Young Child Feeding (IYCF), breastfeeding, Nepal, population-based, antenatal, perinatal, healthcare delivery

Posted Date: May 16th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1628919/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background Infant and Young Child Feeding (IYCF) breastfeeding guidelines of the World Health Organization (WHO) have been promoted in Nepal since the early 1990s. This study investigated whether antenatal and perinatal healthcare delivery in Nepal were associated with breastfeeding within one hour of delivery and age-appropriate IYCF breastfeeding practice (exclusive breastfeeding to six months; continued breastfeeding to two years).

Methods Data from the 2016 Nepal Demographic and Health Survey (NDHS) were analysed using multivariable logistic regression. The unit of analysis was an interviewed woman and her last-born child aged 0–23 months. Healthcare delivery components examined were four completed antenatal visits, place and type of delivery, infant-mother skin-to-skin contact post-delivery, and breastfeeding observation and counselling within two days post-delivery.

Results Of 1938 mother-infant dyads, 1073 (55.4%) commenced breastfeeding within one hour of delivery and 1665 (85.9%) were engaged in age-appropriate breastfeeding. Breastfeeding within one hour of delivery was associated with infants delivered vaginally (aOR: 4.76, 95% CI: 2.96–7.65), mothers who were observed breastfeeding by a health professional (aOR: 1.58, 95% CI: 1.20–2.08) and early skin-to-skin contact (aOR: 2.10, 95% CI: 1.63–2.72). Age-appropriate breastfeeding was lowest amongst those with children aged 4–5 months (40.8%) compared to women with infants aged 0–1 month (aOR: 0.158, 95% CI: 0.083–0.302). Antenatal and perinatal healthcare delivery were not significantly associated with age-appropriate breastfeeding.

Conclusion Further promotion of early skin-to-skin contact and the observation of early breastfeeding practice, including after caesarean births, may increase early initiation of breastfeeding. Additional support, including postnatally, is necessary to increase exclusive breastfeeding of infants 4–5 months of age.

Significance

Previous research on IYCF breastfeeding practice in Nepal has focused on demographic influences rather than antenatal and perinatal healthcare delivery. The study highlights the positive association of perinatal healthcare delivery in Nepal and initiation of breastfeeding within one hour of birth. The low rate (55.6%) of newborns being breastfed within one hour of delivery could be related to gaps in some of these practices. Strengthening the delivery of perinatal breastfeeding support through further promotion of early skin-to-skin contact (including after caesarean delivery), and the observation of and counselling about early breastfeeding practice, may increase the rates of early initiation of breastfeeding and, downstream, improve infant health. The results of this study also suggest that additional support for exclusive breastfeeding, including postnatally, should be considered for women with infants approaching 4–5 months of age, where exclusive breastfeeding rates are only 40.8%.

Introduction

In 2003 the World Health Organisation (WHO), in collaboration with UNICEF, developed the Infant and Young Child Feeding (IYCF) guidelines (World Health Organisation [WHO] & United Nations Children's Fund [UNICEF], 2003) based on research underscoring the foundational role of breastfeeding in improving child development, mortality and morbidity (UNICEF, 2011). These guidelines recommend that all mothers should be supported to:

1. Initiate breastfeeding as soon as possible after birth, ideally, within the first hour after delivery;
2. Exclusively breastfeed their infants for the first six months of life, and;
3. Introduce nutritionally adequate complementary (solid) foods at six months, together with continued breastfeeding up to two years of age or beyond.

Systematic reviews have consistently shown that early initiation of breastfeeding (within the first hour of delivery) is linked with lower all-cause and infection-related neonatal mortality (Debes et al., 2013; Kahn et al., 2015). In a multinational metanalysis of 136,047 breastfed newborns (Smith et al., 2017), newborns breastfed within the first hour post-delivery had a 33% lower risk of dying than those breastfed between two and 23 hours after birth. Exclusive breastfeeding up to six months is associated with a lower incidence of infantile gastrointestinal infection (Kramer & Kakuma 2012), the second leading cause of post-neonatal deaths in children under five (WHO, 2020a). Similarly, exclusive breastfeeding to six months with breast and complementary feeding to 24 months, has been linked to lower rates of malnutrition and childhood stunting (Tiwari et al., 2014).

Nepal adopted several public health policies over the past three decades in an attempt at increasing IYCF breastfeeding practice. In 1992, the *Mother's Milk Substitutes Act*, which established a Breastfeeding Protection and Promotion Committee (BPPC), saw health service collusion with milk-substitute manufacturers criminalised, and formalised the place of breastfeeding promotion strategies within hospitals (Government of Nepal, 1992). Two years later the UNICEF Baby Friendly Hospitals Initiative (BFHI) was implemented and increased breastfeeding coverage across South Asia (Subedi, 2012), a previously low-uptake region (Adhikari et al., 2014). The program's success is primarily attributed to its birth attendant training course, coupled with its facilitation of early skin-to-skin contact (WHO, 2020b; Subedi, 2012). In 2006 the rate of early initiation of breastfeeding was 35% and the percentage of infants who were breastfed exclusively up to six months, 53% (NDHS, 2006). Some improvement was observed in 2011, where the figures neared 45% and 70% respectively (NDHS, 2011).

Many studies have explored demographic factors contributing to breastfeeding practice in Nepal, but few have examined the association with exposure to antenatal and perinatal healthcare delivery (Ghimire, 2019; Adhikari et al., 2014; Bhandari et al. 2019; Acharya & Khanal, 2015). This study aimed to evaluate whether specific components of antenatal and perinatal healthcare delivery (four completed antenatal visits, type and place of delivery, infant-mother skin-to-skin contact post-delivery, and breastfeeding counselling and observation within the first two days post-delivery) are positively associated with the

early initiation of breastfeeding (within one hour of delivery) and current coverage with age-appropriate IYCF breastfeeding practice in Nepali infants up to 24 months of age.

Methods

Data sources

Data was obtained from the 2016 Nepal Demographic and Health Survey (NDHS), a nationally representative cross-sectional household survey, funded by the US Agency for International Development (USAID) (Ministry of Health Nepal [MoHP], 2017). The 2016 NDHS sampling frame was a modified version of the Nepal Central Bureau of Statistics' 2011 National Population and Housing Census (MoHP, 2017). Data was stratified and selected in two stages in rural areas and three stages in urban areas (MoHP, 2017). In urban areas, wards were the primary sampling units (PSU), from which one enumeration area (EA) was derived. Households were subsequently selected from EAs (MoHP, 2017). In rural areas, wards were the PSU from which households were selected directly (MoHP, 2017). Only households containing a woman aged 15–49 the night before survey administration were eligible for interview. Of the 13089 women eligible, 12862 completed the survey, representing a response rate of 98% (MoHP, 2017). For results to be nationally, regionally and provincially representative, weighting factors have been calculated and added to the DHS datafiles (MoHP, 2017). Full details of the NDHS sampling design are discussed elsewhere (MoHP, 2017).

The present study used the Children's Recode DHS file (KR file), with the addition of 11 food security variables from the Individual Women's Data file (IR file). The KR file includes one record for every child (alive or dead) of an interviewed woman born in the five years preceding the survey (MoHP, 2017). In this study, only last-born children up to 24 months, who were still alive and living with their mother, were included for analysis (n = 1930).

Outcome variables

The primary outcome variable, adherence to IYCF breastfeeding practice, was defined according to the child's age. For children 0–5 completed months of age (i.e., under six months), IYCF breastfeeding practice was met if the child was exclusively breastfed at the time of survey administration. A child was determined to be "exclusively breastfed" if they had received breastmilk in the 24 hours preceding the interview but nothing else. Feeding with non-breastmilk liquids (including water) in this period, precluded children from this group (DHS Program, 2020).

For children aged 6–23 completed months (i.e., under 24 months), IYCF breastfeeding practice was deemed to be met if the child had received breastmilk and "complementary foods" in the 24 hours prior to survey administration. According to WHO guidelines, complementary foods include both solid and semi-solid foodstuffs (WHO & UNICEF, 2003).

The secondary outcome variable, early initiation of breastfeeding, defined by WHO as “breastfeeding within the first hour of life” (WHO, 2017), was derived from the DHS question; “How long after birth did you first put (name of child) to the breast?” (MoHP, 2017). Infants put to the breast within one hour of birth were deemed to comply with early initiation of breastfeeding.

Explanatory variables

Explanatory variables were conceptualised according to an adapted version of the conceptual framework employed by Bhandari et al. (2019) (see Fig. 1).

[Figure 1 here]

Variables related to antenatal and perinatal healthcare delivery were informed by the UNICEF and WHO breastfeeding practice guidelines (WHO, 2017): number of antenatal visits (less than 4 visits; 4 + visits), place of delivery (health facility; not in a health facility), type of delivery (vaginal; caesarean), infant-mother skin-to-skin contact post-delivery (yes; no), breastfeeding counselling (yes; no) and breastfeeding observation (yes; no) within the first two days post-delivery.

The selection of potential confounding variables was informed by literature review and identification of factors shown to be associated with breastfeeding practice in Nepal previously (Ghimire, 2019; Bhandari et al., 2019; Adhikari et al., 2014; Acharya & Khanal, 2015). Child-level factors included sex (m; f), age, size at birth (very small/small; average; large) and birth interval (first birth episode; 18 months or less; 19–36 months; 37 months+). Maternal and perinatal level factors included mother’s age (15–19; 20–29; 30–39; 40–49), mother’s occupation (did not work/household duties; agricultural work [paid and unpaid]; non-agricultural work [paid]), mother’s highest education level (no education; primary; secondary; higher education), and place of delivery (home; health facility). Household level factors included the wealth quintile (poorest; poorer; middle; richer; richest), husband’s education level (no education; primary; secondary; higher education), ethnicity (Brahman/Chhetri; other Terai castes; Dalits; Newar; Janajati; Muslim and other) and food security (secure; not secure). The food security variable was coded in accordance with Pandey & Fusaro (2020). Food was “secure” if the summed Household Food Insecurity Access Scale (HFIAS) score was 0; food was “insecure” for any score between 1 and 27 (Pandey & Fusaro, 2020). Community level factors included ecological zone (mountains; hills; Terai), province (1–7) and place of residence (rural; urban).

All variables were treated as categorical variables.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA). Data were weighted using sampling weights in accordance with DHS guidelines (Croft et al. 2018). All analyses used the Complex Sample Analysis module to account for the multi-stage sample design (Croft et al. 2018).

Descriptive summaries were displayed using frequencies and percentages. Cross-tabulations and Chi-square tests were performed for the two binary outcome variables, adherence to IYCF breastfeeding practice and early breastfeeding initiation, by each explanatory variable. Associations between explanatory variables were also explored by Chi-square tests. Where two explanatory variables were significantly associated with each other, only one variable was included in the logistic regression model. Explanatory variables with a p-value of < 0.1 were included in univariable and multivariable logistic regression analyses. The child's sex was included a priori in the regression analyses (Bhandari et al., 2019). Unadjusted and adjusted odds ratios (OR) were computed with 95% confidence intervals.

Ethical approval

The 2016 NDHS survey protocol was approved by the Nepal Health Research Council (NHRC) and the ICF Institutional Review Board (ICF-IRB). The present study received ethics approval from the University of Notre Dame Australia, Fremantle, Human Research Ethics Committee (Ref. 2020-065F). Permission for the use of the 2016 NDHS dataset was granted by the DHS Program. Prior to the DHS interview, participants provided informed consent (DHS Program, 2020).

Results

Table 1 presents the socio-demographic characteristics of the sample population. [Table 1 here]. Of the 1938 children included in this study, 1043 (53.8%) were male and 895 (46.2%) were female. Two-thirds of mothers were 20-29 years of age (n=1311; 67.7%), with 284 (14.7%) aged 15-19 years. About half of mothers either did not work or performed household duties (n=913; 47.1%), while 41.4% were engaged in agricultural (n=803) and 11.4% in other paid work (n=221). The sample contained a mixture of urban (53.8%) and rural (46.2%) residents.

Overall, 1665 (85.9%) were currently adhering to age-appropriate IYCF breastfeeding practice and 1073 (55.4%) breastfed their most recent child within an hour of delivery. Exclusive breastfeeding of infants aged 0-1 month was 79.4% but was only 40.8% in infants aged 4-5 months. Complementary feeding with continued breastfeeding ranged from 83.4% (6-8 months) to 95.6% (12-17 months). More than half of the women delivered in health facilities (n=1178; 60.8%) and most had vaginal deliveries (n=1742; 89.9%), but early skin-to-skin contact was reported to have occurred in only 63.0% (n=1222) of most recent births. Just over half (n=1049; 54.1%) received some counselling regarding breastfeeding from a healthcare provider during the first two days post-delivery and 50.3% (n=974) were observed breastfeeding. Only 71.5% of women attended the recommended 4+ antenatal checks (n=1386).

Variables identified by Chi-square tests to be significantly associated with current IYCF breastfeeding practice included: the age of the child (p<0.0005), the mother's age (p=0.016), the mother's occupation (p=0.001), ethnicity (p<0.001), ecological zone (p=0.007) and province (p<0.001) (*see Table 1*). These explanatory variables were included in the subsequent logistic regression models, as well as the sex of the child (p=0.978), and place of delivery (p=0.084).

Variables identified by Chi-square tests to be significantly correlated with the secondary outcome, breastfeeding within one hour of delivery, included: mother's occupation ($p=0.011$), place of delivery ($p<0.001$), type of delivery ($p<0.001$), skin-to-skin contact after birth ($p<0.001$), counselling regarding breastfeeding within two days post-delivery ($p=0.002$), observation of breastfeeding within two days post-delivery ($p<0.001$), ethnicity ($p=0.001$), ecological zone ($p=0.031$) and province ($p<0.001$). These variables, along with mother's highest education level ($p=0.074$), were included in the logistic regression models. Of note, only 22.6% of infants born by caesarean delivery were breastfed within one hour. Counselling regarding breastfeeding within two days and observation of breastfeeding within two days were highly associated with each other (data not shown), and only the latter (observation of breastfeeding within two days post-delivery) was included in the multivariable model.

Table 2 displays the results of the univariable and multivariable logistic regression analyses [Table 2 here]. After adjustment, the current age of the child significantly influenced the odds of IYCF breastfeeding practice. Infants aged 4-5 months had significantly lower odds of receiving age-appropriate IYCF breastfeeding than infants aged 0-1 month (aOR=0.16, 95% CI: 0.08,0.30), while infants aged 9-11 months, 12-17 months and 18-23 months had 5.09 (95% CI: 2.25, 11.50), 5.599 (95% CI: 2.73,11.47) and 2.46 (95% CI: 1.31,4.64) times the odds of receiving IYCF breastfeeding respectively, when compared to those aged 0-1 months. Significant associations were also observed between IYCF breastfeeding practice, province and mother's age. Infants in Provinces 5 and 7 had higher odds of receiving age-appropriate IYCF breastfeeding than Province 3. Maternal age 40-49 years was significantly associated with age-appropriate IYCF breastfeeding (aOR = 7.35, 95% CI: 1.14, 47.30). No variables related to antenatal or perinatal healthcare delivery were significantly associated with age-appropriate IYCF breastfeeding practice.

After adjustment, infants put on their mother's bare skin immediately after birth had 2.10 times the odds of being breastfed within one hour of delivery compared with those who were not (95% CI: 1.63,2.72). The observation of breastfeeding by a health professional was also associated with increased odds of having been breastfed within the first hour (aOR= 1.58, 95% CI:1.20,2.08). Counselling about breastfeeding by a health professional was also associated with increased odds of having been breastfed within the first hour when it replaced observation of breastfeeding by a health professional in the model (data not shown). Those infants delivered vaginally had markedly greater odds of being breastfed within the first hour, compared with those delivered via caesarean section (aOR: 4.76, 95% CI: 2.96,7.65). Infants from Province 2 had significantly lower odds of being breastfed within the first hour compared to infants in Province 3 (aOR: 0.51, 95% CI: 0.29-0.87).

Discussion

The aim of this study was to determine whether perinatal healthcare delivery was associated with age-appropriate IYCF breastfeeding coverage and early breastfeeding initiation amongst Nepali mother-infant dyads. Our analysis showed that the infant's age, mother's age and province, were significantly associated with age-appropriate IYCF breastfeeding practice. However, none of the antenatal or perinatal

healthcare delivery factors examined significantly influenced the odds of age-appropriate breastfeeding practice after adjustment for potential confounders. By contrast, several perinatal healthcare factors were associated with the early initiation of breastfeeding: vaginal delivery, the observation of breastfeeding within the first two days after delivery and early skin-to-skin contact.

Age-appropriate IYCF breastfeeding practice

Our finding that the odds of age-appropriate IYCF breastfeeding practice were significantly greater from 9-23 months compared to 0-1 months may reflect the lesser difficulty of *some* breastfeeding compared with *exclusive* breastfeeding. Age-appropriate breastfeeding practice up to the sixth month of life constitutes exclusive breastfeeding, with the exemption of all other non-breastmilk liquids. However, age-appropriate breastfeeding practice from 6-24 months (UNICEF, 2011), involves some breastfeeding with the addition of complementary foods. Indeed, multiple physiological and financial barriers to *exclusive* breastfeeding can be conceptualised. Work has been identified as a barrier for continued exclusive breastfeeding in Nepal (Singh Bhandari et al., 2019) and physiologically, breastmilk supply issues may also be considered. Previous research has identified diminished breastmilk supply with time post-delivery as a barrier to exclusive breastfeeding amongst Nepali mothers (Ulak et al., 2012). Our finding that at 4-5 months, the odds of age-appropriate breastfeeding practice (i.e., being exclusively breastfed) are at their lowest, may reflect this phenomenon. Indeed, less than half of infants (40.8%) were exclusively breastfed in this age-group. This finding is also consistent with other studies that demonstrate decreased exclusive breastfeeding approaching six months post-birth (Khanal et al., 2013; Ulak et al., 2012). Given the cross-sectional nature of the present study, the aetiology of this nadir in exclusive breastfeeding cannot be definitively determined. However, our findings that no antenatal or perinatal healthcare delivery factors were associated with age-appropriate breastfeeding practice suggests that additional support for exclusive breastfeeding, including postnatal support, is necessary for women with infants nearing 4-5 months of age, where appropriate IYCF breastfeeding practice is lowest.

Breastfeeding within the first hour after delivery

Our analysis identified vaginal delivery, early skin-to-skin contact and the observation of breastfeeding by a healthcare worker, as significant perinatal healthcare factors associated with the early initiation of breastfeeding. Although vaginal delivery has been associated with early breastfeeding in Nepal previously (Ghimire, 2019; Pandey et al., 2010), the latter two findings have not previously been demonstrated in this population. The relationship between early skin-to-skin contact and breastfeeding initiation is of note, given it is the WHO's first evidence-based recommendation for supporting the initiation and establishment of breastfeeding (WHO, 2017). This recommendation was based on moderate-quality evidence from two Cochrane Pregnancy and Childbirth systematic reviews (Moore et al., 2016; Conde-Agudelo et al., 2016). Moore et al., (2016) reviewed 46 separate trials with 3850 infant-mother pairs and found that immediate or early skin-to-skin contact improved the likelihood of exclusive breastfeeding at hospital discharge to 1 month of age (RR: 1.30, 95% CI: 1.12,1.49). Although the present study did not demonstrate significantly improved odds of exclusive breastfeeding to six months in

mother-infant pairs with early skin-to-skin contact, it did suggest these mothers had improved odds of initiating breastfeeding early; a finding also observed in other South Asian countries (Karim et al., 2018), thereby further underscoring the importance of this practice. The low rate of early skin-to-skin contact after caesarean delivery observed in our study (37.4%; data not shown) may help explain the lower rate of breastfeeding within the first hour after caesarean section.

Unlike previous research that demonstrated improved odds of early breastfeeding with health facility delivery (Ghimire, 2019), higher maternal education (Adhikari et al., 2014; Acharya & Khanal, 2015) and large infant size at birth (Adhikari et al., 2014), these were not identified as significant explanatory variables in the present study after adjustment. However, the observation of breastfeeding by a healthcare provider within the first two days post-delivery (and similarly, counselling of breastfeeding by a healthcare provider within the first two days post-delivery), was significantly associated with early breastfeeding. These practices, along with early skin-to-skin contact, were more common for births within a health facility (data not shown) and may explain the contrasting findings. Although the temporality of the relationships cannot be discerned here, it is plausible that early initiation of breastfeeding may be better facilitated when health professionals are available for observation and troubleshooting post-delivery. The low rate (55.6%) of Nepali newborns being breastfed in the first hour of life could be related to gaps in some of these perinatal services. Further research in this area is indicated.

Strengths and limitations

The NDHS is a large-scale population-based survey that attempts to be nationally representative by means of multi-stage sampling. However, some limitations warrant consideration. By nature of the cross-sectional design, this study cannot determine whether relationships between explanatory and outcome variables are causal. Similarly, respondents were asked to recall specific details regarding their most recent pregnancy. Although this study attempted to minimise potential recall bias by including only last-born children born in the 24 months preceding the survey, it should be acknowledged that recall bias may still exist. Unmeasured confounders may also have influenced the associations observed. Future longitudinal observational studies may offer opportunities to demonstrate cause-effect relationships between antenatal and perinatal healthcare delivery and breastfeeding outcomes.

Conclusions For Practice

This study highlights a positive association between components of perinatal healthcare delivery and initiation of breastfeeding within the first hour after delivery. Further promotion of early skin-to-skin contact (including after caesarean delivery), and the observation of and counselling about early breastfeeding practice, may increase the rates of early initiation of breastfeeding from just over 50% and, downstream, improve infant health. Strengthening of the continuous monitoring and supervision of the Baby Friendly Hospitals Initiative (BFHI) activities in health care settings and the specific training of Skilled Birth Attendants (SBA) will be important in achieving this outcome.

We also identified a large gap in exclusive breastfeeding of infants aged 4-5 months of age in Nepal which was not associated with antenatal or perinatal healthcare delivery. Additional support, including postnatal support, for breastfeeding mothers with infants approaching 4-5 months of age is necessary to address the low rate (40.8%) of exclusive breastfeeding observed in this group.

Declarations

Funding: BH received a short-term mobility scholarship from the Endeavour Leadership Program of the Australian Government to undertake research training in Nepal.

Conflicts of interest/Competing interests: The authors declare that there is no conflict of interest regarding the publication of this article.

Ethics approval: The 2016 Nepal Demographic and Health Survey protocol was approved by the Nepal Health Research Council (NHRC) and the ICF Institutional Review Board (ICF-IRB). This study received ethics approval from the University of Notre Dame Australia, Fremantle, Human Research Ethics Committee (Ref. 2020-065F).

Consent to participate: Participants provided informed consent for the Nepal Demographic and Health Survey 2016^[1].

Consent for publication: Not applicable.

Availability of data and material: Nepal Demographic and Health Survey 2016 [Dataset]. NPKR7HFL.SAV (kids recode); NPIR7HFL.SAV (individual recode). Rockville, Maryland: Ministry of Health, New ERA, and ICF [Producers]. ICF [Distributor], 2017. Available from https://dhsprogram.com/data/dataset/Nepal_Standard-DHS_2016.cfm?flag=0.

Code availability (software application or custom code): Not applicable.

Authors' contributions: BH and HW conceived and designed the study; MB and PP contributed data or analysis tools; BH and HW performed the analysis; BH, HW, MB and PP wrote and revised the paper.

^[1] Hello. My name is __. I am working with Ministry of Health. We are conducting a survey about health and other topics all over Nepal. The information we collect will help the government to plan health services. Your household was selected for the survey. I would like to ask you some questions about your household. The questions usually take about 20 to 30 minutes. All of the answers you give will be confidential and will not

be shared with anyone other than members of our survey team. No part of this interview is being recorded in tape or video. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I

will go on to the next question or you can stop the interview at any time. Do you have any questions? May I begin the interview now?

Acknowledgements

We thank the Australian Government for providing BH with a short-term mobility scholarship from the Endeavour Leadership Program to undertake research training in Nepal. We are also grateful to the DHS program, funded by USAID, for conducting the survey in Nepal and making their data available to us for research purposes.

References

1. Acharya, P., & Khanal, V. (2015). The effect of mother's educational status on early initiation of breastfeeding: further analysis of three consecutive Demographic and Health Surveys. *BMC Public Health*, *15*(1069). <https://doi.org/10.1186/s12889-015-2405-y>
2. Adhikari, M., Khanal, V., Karkee, R., & Gavidia, T. (2014). Factors associated with early initiation of breastfeeding among Nepalese mothers: further analysis of Nepal Demographic and Health Survey, 2011. *International Breastfeeding Journal*, *9*(21). <https://doi.org/10.1186/s13006-014-0021-6>
3. Bhandari, S., Thorne-Lyman, A., Shrestha, B., Neupane, S., Sanny, B., Manohar, S.,... . West, K. (2019). Determinants of infant breastfeeding practices in Nepal: a national study. *International Breastfeeding Journal*, *14*(14). <https://doi.org/10.1186/s13006-019-0208-y>
4. Biks, G., Tariku, A., Wassie, M., & Derso, T. (2018). Mother's Infant and Young Child Feeding (IYCF) knowledge improved timely initiation of complementary feeding of children aged 6–24 months in the rural population of northwest Ethiopia. *BMC Research Notes*, *11*(1), 593. <https://doi.org/10.1186/s13104-018-3703-0>
5. Conde-Agudelo, A., & Diaz-Rossello, J. (2016). Kangaroo mother care to reduce morbidity and mortality in low birth weight infants. *Cochrane Database of Systematic Reviews*, *8*, CD002771. <https://doi.org/10.1002/14651858.CD002771.pub4>
6. Croft, T. N., Marshall, A. M. J., Allen, C. K., et al. (2018). *Guide to DHS Statistics*. Rockville, Maryland, USA: ICF. Retrieved 15 June, 2021, from <https://dhsprogram.com/data/Guide-to-DHS-Statistics/>
7. Debes, A., Kohli, A., Walker, N., Edmond, K., & Mullany, L. (2013). Time to initiation of breastfeeding and neonatal mortality and morbidity: a systematic review. *BMC Public Health*, *13*(3). <https://doi.org/10.1186/1471-2458-13-S3-S19>
8. DHS Program. (2020). *Analysing DHS Data*. Retrieved 14 August, 2021, from https://dhsprogram.com/data/Guide-to-DHS-Statistics/Analyzing_DHS_Data.htm
9. Ghimire, U. (2019). The effect of maternal health service utilisation in early initiation of breastfeeding among Nepalese mothers. *International Breastfeeding Journal*, *14*(33). <https://doi.org/10.1186/s13006-019-0228-7>
10. Government of Nepal (1992). *Policy-Mother's Milk Substitutes (Control of Sale and Distribution) Act*, 2049. Retrieved on 14 August, 2021, from <https://extranet.who.int/nutrition/gina/en/node/8783>

11. Kahn, J., Vesel, L., Bahl, R., & Martines, J. (2015). Timing of breastfeeding initiation and exclusivity of breastfeeding during the first month of life: effects on neonatal mortality and morbidity – a systematic review and meta-analysis. *Maternal and Child Health Journal*, *19*(3), 468–479. <https://doi.org/10.1007/s10995-014-1526-8>
12. Karim, F., Bilah, M., Chowdhury, M., Zaka, N., Manu, A., Arifeen, S., & Khan, A. (2018). Initiation of breastfeeding within one hour of birth and its determinants among normal deliveries at primary and secondary health facilities in Bangladesh: A case-observation study. *PLOS ONE*, *13*(8), e0202508. <https://doi.org/10.1371/journal.pone.0202508>
13. Khanal, V. Sauer, K. & Zhao, Y. (2013). Determinants of complementary feeding practices among Nepalese children aged 6–23 months: findings from the Demographic and Health Survey 2011. *BMC Paediatrics*, *13*(131). <https://doi.org/10.1186/1471-2431-13-131>
14. Kramer, M., & Kakuma, R. (2012). Optimal duration of exclusive breastfeeding. *Cochrane Database of Systematic Reviews*, *8*, CD003517. <https://doi.org/10.1002/14651858.CD003517.pub2>
15. Ministry of Health, Nepal [MoHP]. (2006). *Nepal Demographic and Health Survey, 2006*. Retrieved 14 August, 2021, from <https://dhsprogram.com/pubs/pdf/FR191/FR191.pdf>
16. Ministry of Health, Nepal [MoHP]. (2011). *Nepal Demographic and Health Survey, 2011*. Retrieved 14 August, 2021, from <https://dhsprogram.com/pubs/pdf/FR257/FR257%5B13April2012%5D.pdf>
17. Ministry of Health, Nepal [MoHP]. (2017). *Nepal Demographic and Health Survey, 2016*. Retrieved 14 August, 2021, from <https://dhsprogram.com/pubs/pdf/FR336/FR336.pdf>
18. Moore, E., Bergman, N., Anderson, G., & Medley, N. (2016). Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database of Systematic Reviews*, *11*, CD003519. <https://doi.org/10.1002/14651858.CD003519.pub4>
19. Pandey, S., & Fusaro, V. (2020). Food insecurity among women of reproductive age in Nepal: prevalence and correlates. *BMC Public Health*, *20*(175), 1–11. <https://doi.org/10.1186/s12889-020-8298-4>
20. Pandey, S., Tiwari, K., Senarath, U., Agho, E., & Dibley, M. (2010). Determinants of infant and young child feeding practices in Nepal: secondary data analysis of Demographic and Health Survey 2006. *Food and Nutrition Bulletin*, *13*(2), 334–351. <https://doi.org/10.1177/156482651003100222>
21. Singh Bhandari, M., Manandhar, P., & Tamrakar, D. (2019). Practice of breastfeeding and its barriers among women working in tertiary level hospitals. *Journal of the Nepal Medical Association*, *57*, 8–13.
22. Smith, E., Hurt, L., Chowdhury, R., Sinha, B., Fawzi, W., & Edmond, K. (2017). Delayed breastfeeding initiation and infant survival: a systematic review and meta-analysis. *PLOS ONE*, *12*(7): e0180722. <https://doi.org/10.1371/journal.pone.0180722>
23. Subedi, N. (2012). Baby-Friendly Hospital Initiative: Situation in Nepal. *Health Prospect*, *11*, 53–54. <https://doi.org/10.3126/hprospect.v11i0.7436>
24. Tiwari, R., Ausman, L., & Agho, E. (2014). Determinants of stunting and severe stunting among under-fives: evidence from the 2011 Nepal Demographic and Health Survey. *BMC Paediatrics*, *14*(239).

<https://doi.org/10.1186/1471-2431-14-239>

25. Ulak, M., Chandyo, R., Mellander, L., Shrestha, P., & Strand, T. (2012). Infant feeding practices in Bhaktapur, Nepal: a cross-sectional, health facility based survey. *International Breastfeeding Journal*, 7(1). <https://doi.org/10.1186/1746-4358-7-1>
26. UNICEF. (2011). *Infant and Young Child Feeding Program Guide*. UNICEF Publishing. Retrieved on 14 September, 2021, from <https://www.enonline.net/attachments/1470/unicef-iyfc-programming-guide-may-26-2011.pdf>
27. World Health Organisation (WHO). (2020a). Global Strategy for Infant and Young Child Feeding. Retrieved on 14 September, 2021, from <https://www.who.int/publications/i/item/9241562218>
28. World Health Organisation (WHO). (2020b). Ten steps to successful breastfeeding. Retrieved on 14 August, 2021, from <https://www.who.int/activities/promoting-baby-friendly-hospitals/ten-steps-to-successful-breastfeeding>
29. World Health Organisation (WHO). (2017). Guideline: protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services. Retrieved on 14 September, 2021, from <https://apps.who.int/iris/handle/10665/259386>
30. World Health Organisation (WHO) & United Nations Children's Fund (UNICEF). (2003). Global strategy for infant and young child feeding. Retrieved on 14 August, 2021, from <https://apps.who.int/iris/bitstream/handle/10665/42590/9241562218.pdf?sequence=1>

Tables

Table 1: Characteristics of the sample population and distribution of age-appropriate IYCF breastfeeding practice and breastfeeding within the first hour of birth according to these characteristics.

	N (%)	Age-appropriate IYCF breastfeeding practice N (%)	P-value ^a	Breastfed within first hour N (%)	P-value ^a
Total	1938 (100)	1665 (85.9)		1073 (55.4)	
<u>Child factors</u>					
<i>Sex^b</i>			0.978		0.146
Male	1043 (53.8)	895 (85.9)		560 (53.7)	
Female	895 (46.2)	769 (85.9)		513 (57.3)	
<i>Current Age (months)</i>			<0.0005		
0-1month	159 (8.2)	127 (79.4)		N/A	
2-3months	160 (8.2)	115 (72.3)			
4-5months	124 (6.4)	51 (40.8)			
6-8months	235 (12.1)	196 (83.4)			
9-11months	264 (13.6)	250 (95.1)			
12-17months	504 (26.0)	482 (95.6)			
18-23months	492 (25.4)	444 (90.2)			
<i>Size at birth^b</i>			0.627		0.199
Very small/small	331 (17.1)	290 (87.6)		172 (52.0)	
Average	1318 (68.0)	1124 (85.3)		727 (55.2)	
Large	288 (14.9)	250 (86.8)		173	

				(60.1)	
<i>Birth interval</i>				0.158	0.828
	First birth episode	792 (40.9)	684 (86.4)	437 (55.2)	
	18 months or less	100 (5.2)	79 (79.0)	60 (60.0)	
	19-36months	428 (22.1)	360 (84.1)	233 (54.3)	
	37months+	617 (32.0)	542 (87.7)	343 (55.6)	
<i>Maternal factors</i>					
<i>Current age (years)^b</i>				0.016	0.575
	15-19	284 (14.7)	229 (80.6)	157 (55.3)	
	20-29	1311 (67.7)	1136 (87.0)	728 (55.5)	
	30-39	314 (16.2)	271 (86.3)	176 (56.1)	
	40-49	29 (1.5)	28 (100) ^b	12 (41.4)	
<i>Occupation</i>				0.001	0.011
	Did not work for pay/ household duties	913 (47.1)	749 (82.0)	465 (50.9)	
	Agricultural work (paid and unpaid)	803 (41.4)	719 (89.4)	481 (59.9)	
	Non-agricultural work(paid)	221 (11.4)	197 (89.1)	126 (57.0)	
<i>Highest education level^b</i>				0.901	0.074
	No education	555 (28.6)	473 (85.2)	275 (49.5)	
	Primary	380 (19.7)	324 (85.3)	220 (57.7)	
	Secondary	707 (36.5)	612 (86.6)	415	

				(58.7))	
	Higher education (tertiary +)	295 (15.2)	255 (86.4)	163 (55.3)	
Perinatal healthcare delivery					
<i>Type of delivery</i>				0.854	<0.001
	Vaginal	1742(89.9)	1496 (85.9)	1029 (59.0)	
	Caesarean	195 (10.1)	169 (86.2)	44 (22.6)	
<i>Place of delivery</i>				0.084	<0.001
	Home	666 (34.4)	567 (85.1)	316 (47.5)	
	Health facility	1178 (60.8)	1025 (87.0)	709 (60.2)	
	Other	94 (4.8)	73 (77.7)	47 (50.5)	
<i>4+ Antenatal visits</i>				0.634	0.165
	Less than 4 visits	552 (28.5)	470 (85.1)	284 (51.4)	
	4+ visits	1386 (71.5)	1195 (86.2)	789 (56.9)	
<i>Child put on mother's bare skin after birth^c</i>				0.521	<0.001
	No	695 (35.9)	592 (85.2)	281(40.4)	
	Yes	1222 (63.0)	1054 (86.3)	789 (64.6)	
	Don't know ^e	21 (1.1)		22(N/A)	
<i>Breastfeeding counselling from any</i>				0.339	0.002

<i>health provider during first 2 days</i>					
No	882 (45.5)	751 (85.1)		445 (50.4)	
Yes	1049 (54.1)	912 (86.9)		627 (59.8)	
Don't know ^e	6(0.3)				
<i>Observation of breastfeeding by any health provider during first 2 days</i>			0.334		<0.001
No	959 (49.5)	816 (85.1)		477 (49.8)	
Yes	974 (50.3)	847 (87.0)		596 (61.3)	
Don't know ^e	5(0.2)				
<i>Household level factors</i>					
<i>Wealth quintile</i>			0.218		0.133
Poorest	405 (20.9)	364 (89.7)		252 (62.2)	
Poorer	408 (21.0)	352 (86.3)		221 (54.2)	
Middle	444 (22.9)	379 (85.4)		230 (52.3)	
Richer	398 (20.6)	334 (83.9)		227 (57.0)	
Richest	283 (14.6)	237 (83.7)		144 (51.4)	
<i>Husband's education level^d</i>			0.794		0.025
No education	255 (13.1)	220 (86.6)		131 (51.4)	
Primary	435 (22.5)	368 (84.6)		218 (50.2)	

	Secondary	863 (44.6)	748 (86.6)	516 (59.9)
	Higher education (tertiary +)	377 (19.5)	322 (85.2)	209 (55.9)
	Don't know ^e	2 (0.1)		
<i>Ethnicity</i>			<0.001	0.001
	Brahman/Chhetri	524 (27.0)	464 (88.7)	322 (61.6)
	Other Terai Castes	387 (20.0)	316 (81.4)	178 (46.1)
	Dalits	268 (13.8)	223 (83.2)	150 (56.4)
	Newar	61 (3.1)	58 (95.1)	20 (32.8)
	Janajati	546 (28.2)	487 (89.2)	319 (59.0)
	Muslim and other	151 (7.8)	117 (77.0)	83 (54.6)
<i>Food Security</i>			0.493	0.911
	Secure	791 (40.8)	674 (85.2)	435 (55.4)
	Not secure	1147 (59.2)	991 (86.4)	637 (55.7)
<u>Community level factors</u>				
<i>Ecological zone^b</i>			0.007	0.031
	Terai	1065 (55.0)	887 (83.3)	555 (52.4)
	Mountain	127 (6.5)	112 (88.2)	78 (61.9)
	Hill	746 (38.5)	665 (89.3)	440 (59.2)
<i>Province</i>			<0.001	<0.001
	Province 1	335 (17.3)	285 (84.8)	173 (51.6)
	Province 2	501 (25.8)	394 (78.6)	227 (45.6)

Province 3	305 (15.7)	266 (87.2)	175 (57.9)
Province 4	162 (8.4)	147 (90.7)	89 (54.9)
Province 5	354 (18.3)	318 (89.6)	213 (60.2)
Province 6	118 (6.1)	104 (88.1)	81 (68.6)
Province 7	162 (8.4)	151 (93.2)	115 (71.9)
<i>Type of place of residence</i>			
		0.852	0.111
Urban	1042 (53.8)	894 (85.7)	600 (57.9)
Rural	895 (46.2)	771 (86.0)	473 (52.9)

Notes:

Bold text indicates $p < 0.1$ and included in subsequent regression models.

^a P-value from complex sample chi-squared tests.

^b 1 missing value excluded from analysis.

^c 2 missing values excluded from analysis.

^d 5 missing values excluded from analysis.

^e "Don't know" values excluded from further analysis.

Table 2: Unadjusted and adjusted odds ratios for age-appropriate IYCF breastfeeding practice and breastfeeding within one hour post-delivery (n=1938).

	Age-appropriate IYCF breastfeeding practice Unadjusted OR (95% CI)	Age-appropriate IYCF breastfeeding practice Adjusted OR (95% CI)	Breastfeeding within first hour Unadjusted OR (95% CI)	Breastfeeding within first hour Adjusted OR (95% CI)
Sex of child				
Male	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
Female	1.00 (0.74-1.37)	0.99 (0.679-1.435)	1.160 (0.95-1.42)	1.24 (1.00-1.54)*
Age in months				
0-1month	1.00 Ref			
2-3months	0.67 (0.36- 1.26)	0.68 (0.35-1.32)		
4-5months	0.18 (0.01-0.33)***	0.16 (0.08-0.30)***		
6-8months	1.27 (0.72-2.26)	1.31 (0.72-2.39)		
9-11months	4.83 (2.12-10.97)***	5.09 (2.25-11. 50)***		
12-17months	.57 (2.74-11.32)***	5.60 (2.73-11.47)***		
18-23months	.39 (1.31-4.39)**	2.46 (1.31-4.64)**		
Mothers age^a				
15-19	0.65 (0.45-0.92)*	0.85(0.52-1.40)		
20-29	1.00 Ref	1.00 Ref		
30-39	0.96 (0.64-1.46)	0.90 (0.56-1.43)		
40-49	10.60 (1.41-79.56)*	7.35 (1.14-47.29)*		
Mother's Highest education level				
No education			1.00 Ref	1.00 Ref

Primary			1.39 (0.99-1.96)	1.25 (0.86-1.82)
Secondary			1.45 (1.05-1.99)*	1.10 (0.80-1.52)
Higher education			1.25 (0.82-1.90)	1.00 (0.62-1.60)
<i>Mother's Occupation</i>				
<i>Did not work for pay/ household duties</i>	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
<i>Agricultural work (paid and unpaid)</i>	1.86 (1.35-2.56)***	1.27 (0.83-1.95)	1.44 (1.15-1.80)**	1.21 (0.94-1.57)
<i>Non-agricultural work(paid)</i>	1.80 (1.02-3.18)*	1.15 (0.62-2.13)	1.29 (0.87-1.90)	1.26 (0.83-1.91)
<i>Husband's Highest education level</i>				
No education			1.00 Ref	1.00 Ref
Primary			0.95(0.68-1.32)	0.79 (0.55-1.13)
Secondary			1.41(0.99-2.00)	1.16 (0.82-1.64)
Higher education			1.17(0.76-1.81)	0.93 (0.60-1.46)
<i>Type of delivery</i>				
<i>Caesarean</i>			1.00 Ref	1.00 Ref
<i>Vaginal</i>			4.95 (3.31-7.43)***	4.76 (2.96-7.65)***
<i>Place of delivery</i>				
<i>Home</i>	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
<i>Health facility</i>	1.17 (0.85-1.62)	1.10 (0.75-1.62)	1.67 (1.29-2.15)***	1.29 (0.94-1.78)
<i>Other</i>	0.60 (0.31-1.15)	0.66 (0.29-1.53)	1.13 (0.67-	0.95 (0.55-

			1.90)	1.63)
Child put on mother's bare skin immediately after birth^b				
No			1.00 Ref	1.00 Ref
Yes			2.69 (2.16-3.33) ***	2.10 (1.63-2.72) ***
Counselling from health provider RE breastfeeding during first 2 days				
No/Don't know			1.00 Ref	
Yes			1.46(1.17-1.83) ***	
Observation of breastfeeding by health provider during first 2 days				
No			1.00 Ref	1.00 Ref
Yes			1.60 (1.28-2.00) ***	1.58 (1.20-2.08)**
Ethnicity				
Brahman/Chhetri	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
Other Terai Castes	0.56 (0.37-0.87)**	0.75 (0.44-1.29)	0.53 (0.37-0.78)**	1.18 (0.70-1.97)
Dalits	0.63 (0.38-1.04)	0.60 (0.35-1.02)	0.80 (0.55-1.16)	1.16 (0.76-1.76)
Newar	2.49(0.58-10.73)	2.39 (0.61-9.42)	0.31 (0.13-0.75)*	0.46 (0.19-1.10)
Janajati	1.06 (0.67-1.66)	1.07 (0.66-1.74)	0.88 (0.65-1.20)	1.21 (0.87-1.67)
Muslim and other	0.44 (0.27-0.71)***	0.54 (0.29-1.02)	0.76(0.50-1.14)	1.55(0.89-2.68)

Ecological zone^a				
<i>Terai</i>	0.60 (0.43-0.85)**	0.86 (0.56-1.30)	0.76(0.58-0.98)*	0.98 (0.68-1.42)
<i>Mountain</i>	0.92 (0.47-1.80)	0.82(0.42-1.60)	1.12 (0.75-1.67)	1.28(0.76-2.14)
<i>Hill</i>	1.00 Ref	1.00 <i>Ref</i>	1.00 Ref	1.00 <i>Ref</i>
Province				
<i>Province 1</i>	0.83 (0.45-1.52)	0.96 (0.53-1.76)	0.79 (0.50-1.24)	0.70 (0.42-1.14)
<i>Province 2</i>	0.54 (0.31-0.96)*	0.98 (0.50-1.91)	0.62(0.41-0.93)*	0.51(0.29-0.87)*
<i>Province 3</i>	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
<i>Province 4</i>	1.44 (0.71-2.93)	1.65 (0.84-3.25)	0.90 (0.59-1.38)	0.79 (0.51-1.22)
<i>Province 5</i>	1.27 (0.69-2.35)	1.93 (1.02-3.67)*	1.12 (0.74-1.68)	0.85 (0.54-1.32)
<i>Province 6</i>	1.14 (0.58-2.22)	1.69 (0.81-3.51)	1.61 (1.01-2.56)*	1.40 (0.88-2.24)
<i>Province 7</i>	2.04 (1.07-3.89)*	3.11 (1.54-6.30)**	1.85 (1.23-2.77)**	1.31 (0.83-2.07)

Notes:

Bold text indicates statistically significant result.

*p <0.05, ** p <0.01, *** p<0.001.

^a 1 missing value that was excluded from analysis.

^b 2 missing values that were excluded from analysis.

Figures

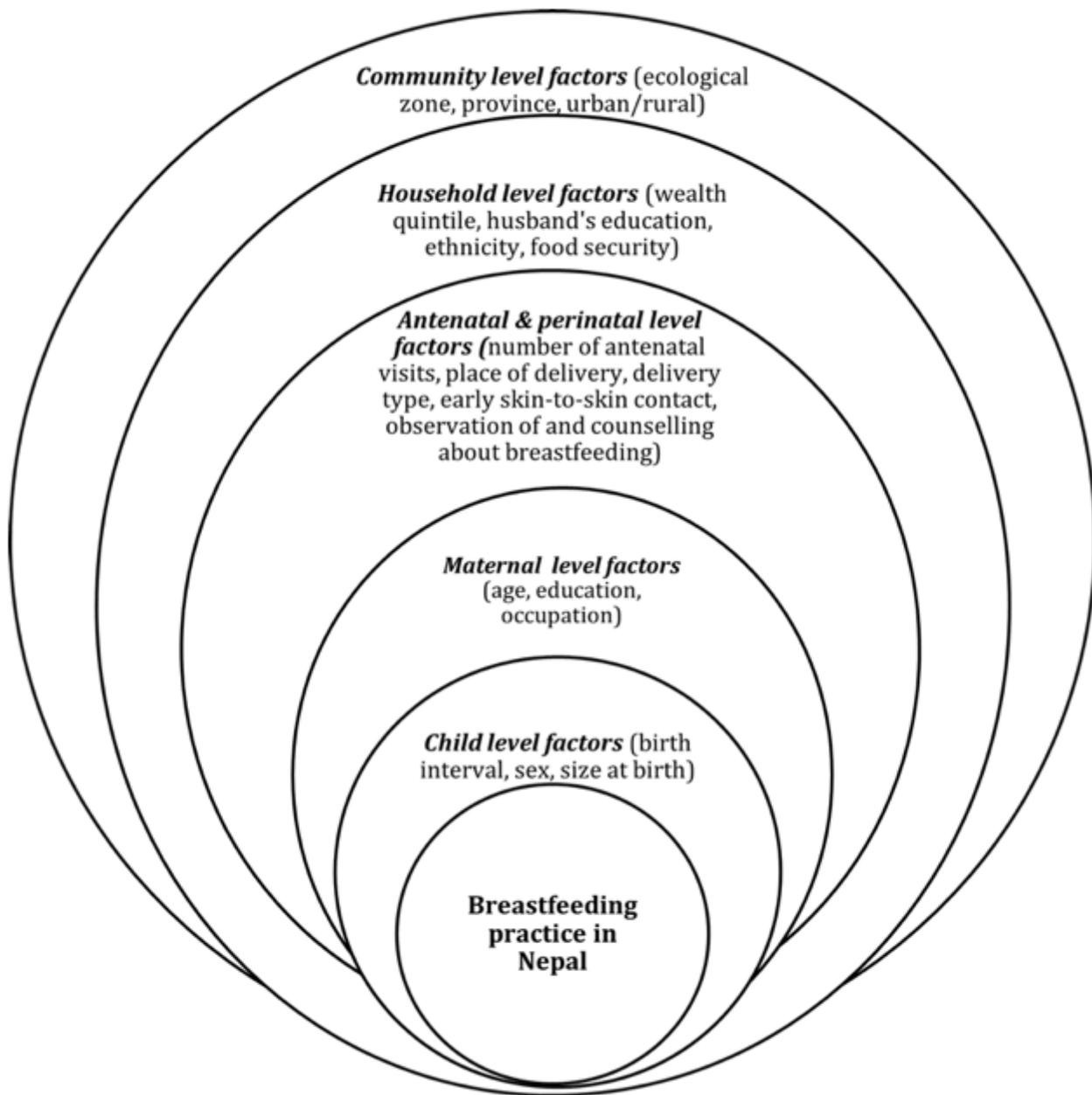


Figure 1

Adapted conceptual framework for breastfeeding practice in Nepal (Bhandari et al., 2019).