



# Disparities in early initiation of breast feeding and prelacteal feeding: A study of low- and middle-income countries

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## Abstract

**Background:** Early initiation of breast feeding (EIBF) reduces the risk of neonatal mortality. However, only 45% of newborns are breast-fed within the first hour after birth and prelacteal feeding (PLF) is widely prevalent in low- and middle-income countries (LMICs).

**Objective:** To assess within- and between-country disparities in EIBF and PLF practices by household wealth and place of birth and to investigate the national-level correlation between these feeding indicators in LMICs.

**Methods:** Data from Demographic Health Surveys and Multiple Indicator Cluster Surveys (2010–2019) in 76 LMICs were used to investigate within-country disparities in EIBF, any PLF, milk-based prelacteal feeding (MPLF), and water-based prelacteal feeding (WPLF) by wealth quintiles and place of childbirth (institutional [private or public sector] or in-home) for children under two years. We examined the between-country Pearson's correlation between EIBF and types of PLF, later adjusted for per capita gross domestic product (GDP).

**Results:** No clear wealth-related differences were found for EIBF and WPLF; however, any PLF and MPLF were significantly higher in children belonging to the richest 20% of households but are also prevalent among lower income groups. Prevalence of any PLF was higher among institutional births in all LMICs, but especially for MPLF in private sector deliveries in East Asia & the Pacific, Eastern Europe & Central Asia, and Latin America & the Caribbean. WPLF was more common in all African regions. EIBF was inversely correlated with any PLF ( $r = -0.59$ , 95% CI  $-0.72, -0.42$ ), MPLF ( $r = -0.41$ , 95% CI  $-0.58, -0.21$ ) and WPLF ( $r = -0.34$ , 95% CI  $-0.53, -0.13$ ). Adjustment for log-GDP did not affect the magnitude and direction of the results.

**Conclusion:** Clear proric disparities exist in the prevalence of PLF, especially MPLF. Children born in private sector facilities are more likely to receive MPLF. EIBF is negatively associated with PLF practices in LMICs. The promotion of better early feeding practices is urgent to achieve the Sustainable Development Goal to reduce neonatal mortality to 12 deaths per 1000 live births.

## KEYWORDS

breast feeding, child nutrition, feeding practices, health equity, low- and middle-income countries, prelacteal feeding

## 1 | BACKGROUND

Breast feeding reduces the risk of neonatal mortality<sup>1-3</sup> and offers health, growth and development benefits to infants and children through adulthood.<sup>2,4</sup> It protects women against the risk of short spacing between pregnancies, breast and ovarian cancer and type 2 diabetes.<sup>2,4</sup> It also saves money for families by not having to buy expensive commercial milk formulas, supports national development through increases in intelligence and educational attainment and does not harm the environment.<sup>4-6</sup>

Many barriers still negatively affect prompt initiation of breast feeding immediately after birth, including lack of health care, social protection and economic policies.<sup>6,7</sup> According to UNICEF, in 2015 only 45% of newborns (63 million out of 140 million) were breast-fed within the first hour after birth in low- and middle-income countries (LMICs).<sup>3</sup>

Delayed breast-feeding initiation, that is, after the first hour of life, hampers the establishment of lactation.<sup>8,9</sup> It also increases the probability of introducing prelacteal feeds,<sup>10-12</sup> likely interfering with the onset and establishment of later breast-feeding practices such as exclusive and continued breast feeding.<sup>13-15</sup> Although there is no standard definition for prelacteal feeding,<sup>16</sup> most guidelines and studies define it as either the introduction of foods other than breast milk before initiating breast feeding or before the physiological onset of lactation happens.<sup>16,17</sup> In spite of these differences, there is consensus that prelacteal feeding involves the introduction of fluids or foods other than breastmilk during the early neonatal period.<sup>18</sup> Milk-based prelacteals are usually offered to replace or supplement human milk in response to perceiving insufficient milk production while the milk comes in and in some cases for medical reasons such as early neonatal weight loss. By contrast, water-based prelacteals are often used for religious, cultural beliefs or other social factors, and in some instances for specific medical reasons such as newborn dehydration.<sup>17</sup>

Prelacteal feeding is highly prevalent in LMICs. In a report from UNICEF, 25% of newborns received water-based and 18% milk-based prelacteals in 72 LMICs with surveys between 2010 and 2014.<sup>3</sup> Oakley et al.,<sup>19</sup> using data from 57 Demographic Health Surveys (DHS) conducted between 2000 and 2013, documented that 50.8% of children under two years in LMICs received prelacteal feeds within the first three days of life. Additionally, children born in private health facilities were more likely to receive prelacteal feeds,<sup>19</sup> although these patterns varied substantially across world regions.<sup>3,8,19</sup>

Early initiation of breast feeding has improved recently, but progress is still modest.<sup>3,20</sup> Therefore, we aimed to (a) describe wealth-related differences in early initiation of breast feeding and prelacteal feeding (any, milk-based and water-based) among children under two

### Synopsis

#### Study question

Are there disparities in early initiation of breast feeding (EIBF) and prelacteal feeding (PLF) by household wealth and childbirth location in low- and middle-income countries (LMICs)?

#### What's already known

While EIBF is higher among births in public health facilities, PLF is more common in the private health sector in LMICs. However, there is no evidence of differences in EIBF and types of PLF (milk-based [MPLF] and water-based [WPLF]) by place of birth or household wealth.

#### What this study adds

Prorich disparities exist for MPLF but not for WPLF and EIBF. Children born in private health facilities were more likely to receive MPLF. African countries displayed the highest consumption of WPLF regardless of place of delivery. EIBF is inversely associated with PLF in LMICs.

years of age in LMICs; (b) examine the share of types of prelacteal feeds by place of delivery (public or private facilities and home deliveries); (c) explore the country-level correlation between early initiation of breast feeding and types of prelacteal feeding.

## 2 | METHODS

### 2.1 | Data sources and definition of feeding indicators

We analysed publicly available data from nationally representative DHS and Multiple Indicator Cluster Surveys (MICS) carried out in LMICs. These cross-sectional surveys collect information on household characteristics, reproductive health, maternal and child health and nutrition, employing multistage sampling to select women of reproductive age (15–49 years) and children under five years. Sampling designs are based on two-stage (cluster and household) probability samples drawn from an existing sample frame. In almost all instances, the estimates are representative at the national, residence (urban–rural) and regional (administrative) levels.<sup>21</sup>

The general sampling strategy consists of selecting the primary sampling units (census tracts) with probability proportional to size within strata. Sample strata are level-1 administrative divisions (such as states or provinces) divided in urban and rural areas. After the primary sampling units are selected, households within them are sampled through a systematic sampling procedure. Given that the sampling fractions will be different across strata, sampling weights are calculated to allow representative national-level estimation. Trained fieldworkers interview women regarding infant and young child feeding practices using a 24-h food recall for the youngest child in the household.<sup>22</sup> We selected the most recent survey for each country carried out since 2010, and the analysis was restricted to children born in the previous 24 months preceding the survey.

We followed the WHO<sup>22</sup> and DHS/MICS<sup>8,10,12</sup> definitions to estimate four feeding indicators: *early initiation of breast feeding* (proportion of children put to the breast within one hour after birth), *any prelacteal feeding* (proportion of children ever breast-fed and received any type of liquid [not considering breast milk] in the first three days of life), *milk-based prelacteal feeding* (proportion of children ever breast-fed and received milk-based liquids [formula and animal milk, not considering breast milk] in the first three days of life), and *water-based prelacteal feeding* (proportion of children ever breast-fed and received water-based liquids [water, tea, honey, juice, sugar water, etc.] in the first three days of life). Following WHO and DHS recommendations, missing values and 'don't know' options were classified as 'not consumed'.<sup>10,22</sup>

We checked the consistency of our recalculated estimates by comparison with published figures in DHS/MICS reports for early initiation of breast feeding and any prelacteal feeding. We did not find any difference in early initiation of breast feeding. However, we noticed that our estimates for any prelacteal feeding did not match closely estimates in the report given differences in the definitions used.<sup>10,22</sup>

Wealth-related disparities were explored using an asset index<sup>21</sup> provided in the data sets, based on the presence of different assets in the household (radio, car, television, refrigerator, etc.) and building characteristics (building materials, toilet, electricity, etc.). A principal component analysis was performed to derive a composite score and later adjusted for urban and rural residence to improve comparability.<sup>23,24</sup> The resulting index was split into quintiles, where the first quintile represents the 20% poorest households while the fifth quintile represents the 20% richest households.

## 2.2 | Statistical analysis

We estimated the prevalence of feeding indicators for each country using individual-level data and considering the complex design of the surveys. Then, a unique pooled data set containing all national estimates for the indicators was created and handled in this aggregate-level analysis.

We used the population size estimates of children under two years for each country in the year the survey was conducted,<sup>25</sup> to generate weighted mean estimates of the prevalence of feeding indicators according to World Bank income and UNICEF world regions classification.<sup>26,27</sup> Table S1 provides a list of the countries included, their regional and income classification, the sample size studied and the feeding indicators prevalence.

Regarding place of delivery, we calculated the percentage of children delivered in-home (respondent's home) or in a health facility by sector (*private* [private hospital or clinic, other private medical facilities] or *public* [government hospital, government health centre, government health post or other public facility]), regardless of the level of facility and health worker cadre who assisted with the birth).

We explored the country-level association between the prevalence of early initiation of breast feeding and types of prelacteal feeding using Pearson's correlation, considering countries as the unit of analysis. Partial correlations were also estimated adjusting correlations to log-transformed national gross domestic product per capita (2011 international dollars).<sup>28</sup> Since the surveys were cross-sectional and data regarding prelacteal feeding were retrospectively ascertained, we investigated if recall bias could affect our findings by calculating Pearson's and partial correlation by child age in months. For simplicity, we grouped this analysis by six-month-age groups. All analyses were carried out in Stata 17 (StataCorp).

## 2.3 | Missing data

The proportion of missing information by country ranged from 0.0% to 8.3% for early initiation of breast feeding and place of delivery and 0.8% to 16.0% for prelacteal feeding (Table S2). To assess the impact of missing data, sensitivity analyses were performed by using only the 63 countries with <10% of missing values for prelacteal feeding.

## 3 | RESULTS

Out of 106 available surveys, 76 were eligible for this study (Figure S1). Surveys were conducted between 2010 and 2019. The median number of children under two years was 2,895, ranging from 98 in Saint Lucia to 97,935 in India. Studied countries represented 50% of upper-middle, 61.5% of lower-middle and 51.6% of low-income countries.

The mean prevalence of early initiation of breast feeding was 49.9%, ranging from 7.7% (Serbia) to 83.3% (Kazakhstan). The prevalence for any, milk-based and water-based prelacteal feeding was 30.1% (2.3% in Turkmenistan to 86.7% in Chad), 18.2% (<0.1% in Guinea-Bissau to 66.8% in Vietnam) and 14.1% (1.1% in Turkmenistan to 84.4% in Chad), respectively (Tables S3-S10).

Figure 1 shows the prevalence of feeding indicators by wealth quintiles and regions of the world. We found no clear differences in

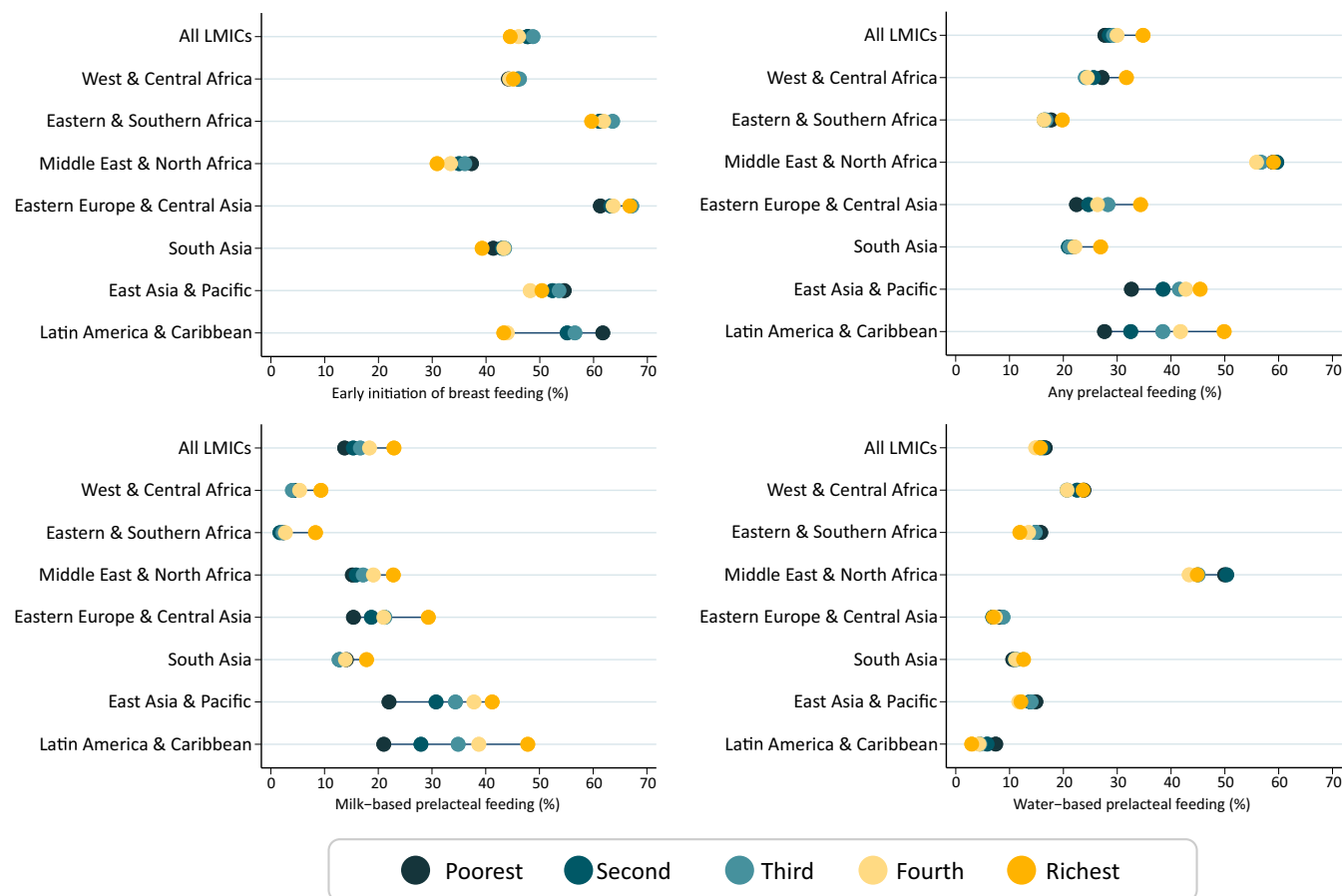


FIGURE 1 Wealth-related differences in the prevalence of the feeding indicators, grouped by world region.

Source: DHS and MICS, 2010–2019

early initiation of breast feeding in most regions, with the exception of Latin America & the Caribbean (18.4 percentage points of difference between the poorest and wealthiest quintiles) (Table S11).

With respect to any prelacteal feeding, most regions showed higher prevalence in the wealthiest group, the exceptions were Eastern & Southern Africa, and the Middle East & North Africa where no clear pattern was found. Latin America & the Caribbean stood out with a 22.3 percentage points difference between rich and poor families. There were clear proric disparities in all regions of the world for milk-based prelacteal feeds. Differences between the richest and poorest families were more evident in Eastern Europe & Central Asia, East Asia & the Pacific, and Latin America & the Caribbean; in the last two regions, the gap was more than 20 percentage points. Conversely, we did not observe any clear disparity pattern for water-based prelacteals, except for the Middle East & North Africa that showed a small propoor gap (Figure 1, Tables S12–S14).

The Middle East & North Africa and Latin America & the Caribbean showed differences in the prevalence of early initiation of breast feeding by place of delivery, where children born in private facilities versus those born in public facilities and in home were less likely to be put to the breast within the first hour after birth. Early initiation of breast feeding was significantly higher in public health

sector childbirths in South Asia compared with private sector and in-home deliveries (Table S7; Figure 2).

Figure 3 shows the types of prelacteal feeds by place of delivery, grouping countries by regions of the world. Pooled analysis for all LMICs showed that prelacteal feeding was more frequent in private sector births, represented mostly by milk-based prelacteals. In all African regions, the main prelacteals given were water-based. More than 50% of children in the Middle East & North Africa received any prelacteal feeding, where water-based-only prelacteal was the main type given in all delivery settings. Patterns were different in other regions where milk-based represented the highest share among all prelacteals, especially in private facility deliveries, for example in East Asia & the Pacific, Eastern Europe & Central Asia, and Latin America & the Caribbean. In the latter, more than half of children born in the private sector received a milk-based-only prelacteal feed. Interestingly, in Eastern Europe & Central Asia the prevalence of any prelacteal feeding was higher among in-home births than in institutional births, and water-based-only prelacteals represented the highest share among in-home births and milk-based-only among private sector births (Table S15).

Figure 4 shows the between-country Pearson's correlation between early initiation of breast feeding and prelacteal feeding indicators. Early initiation of breast feeding was moderately and inversely

correlated with all prelacteal indicators. After adjustment by log-gross domestic product, the partial correlation remained virtually the same, equal to  $-0.59$  (95% confidence interval [95% CI]  $-0.71$ ,  $-0.41$ ) for any prelacteal feeding,  $-0.44$  (95% CI  $-0.60$ ,  $-0.24$ ) for milk-based prelacteals and  $-0.40$  (95% CI  $-0.59$ ,  $-0.20$ ) for water-based prelacteal feeding. Analysis by children's age did not show any age-related pattern influencing the ecological correlations between the feeding indicators (Table 1), even after adjustment for log-gross domestic product (data not shown). Our results did not change in a relevant way when excluding 13 countries with  $\geq 10\%$  of missing values for prelacteal feeding, except for any prelacteal feeding in the public sector hospital deliveries in Eastern & Southern Africa and East Asia & Pacific (Tables S16–S18).

## 4 | COMMENT

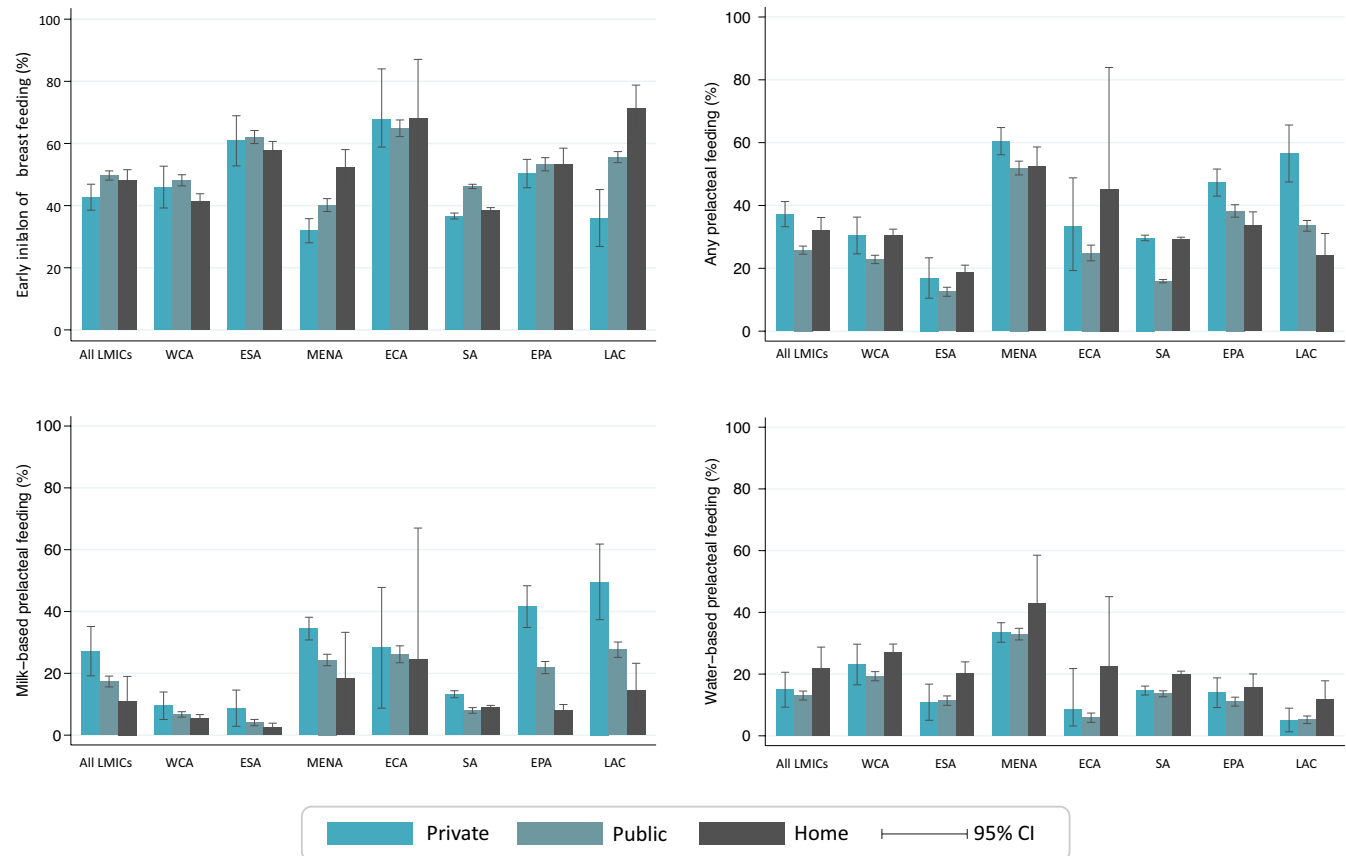
### 4.1 | Principal findings

Our findings demonstrate that wealth-related differences exist in the prevalence of children who received prelacteal feeds in the first three days after birth in LMICs, as this practice was more common

among children from wealthy families, especially for milk-based prelacteal feeds. No clear patterns were observed for water-based prelacteals nor early initiation of breast feeding. Children born in private health facilities were more likely to receive milk-based prelacteal feeds. Water-based prelacteals were often reported for in-home childbirths, and it is the most widely prelacteal offered in all African regions. The correlation analysis demonstrated an inverse and moderate association between early initiation of breast feeding with prelacteal feeding practices, even after adjusting for national income, and child age.

### 4.2 | Strengths of the study

To our knowledge, this is the most comprehensive multi-country analysis aimed at researching disparities in early initiation of breast feeding and prelacteal feeding practices in LMICs in terms of household wealth and place of delivery. The high comparability between DHS and MICS surveys allowed us to include a large number of countries to describe disparity patterns in different types of prelacteal feeds. Also, the geographical diversity of included studies increases the generalisation of the findings. Data from DHS/MICS surveys are



**FIGURE 2** Average weighted prevalence of the feeding indicators by place of delivery (institutional delivery [private or public] or home delivery) according to regions of the world.

Source: DHS and MICS, 2010–2019. EAP, East Asia & the Pacific; ECA, Eastern Europe & Central Asia; ESA, Eastern & Southern Africa; LAC, Latin America & the Caribbean; LMICs, low- and middle-income countries; MENA, Middle East & North Africa; SA, South Asia; WCA, West & Central Africa

widely used to describe feeding patterns across the globe, and international agencies, such as WHO and UNICEF, acknowledge its use as an important source of information about infant and young feeding practices.

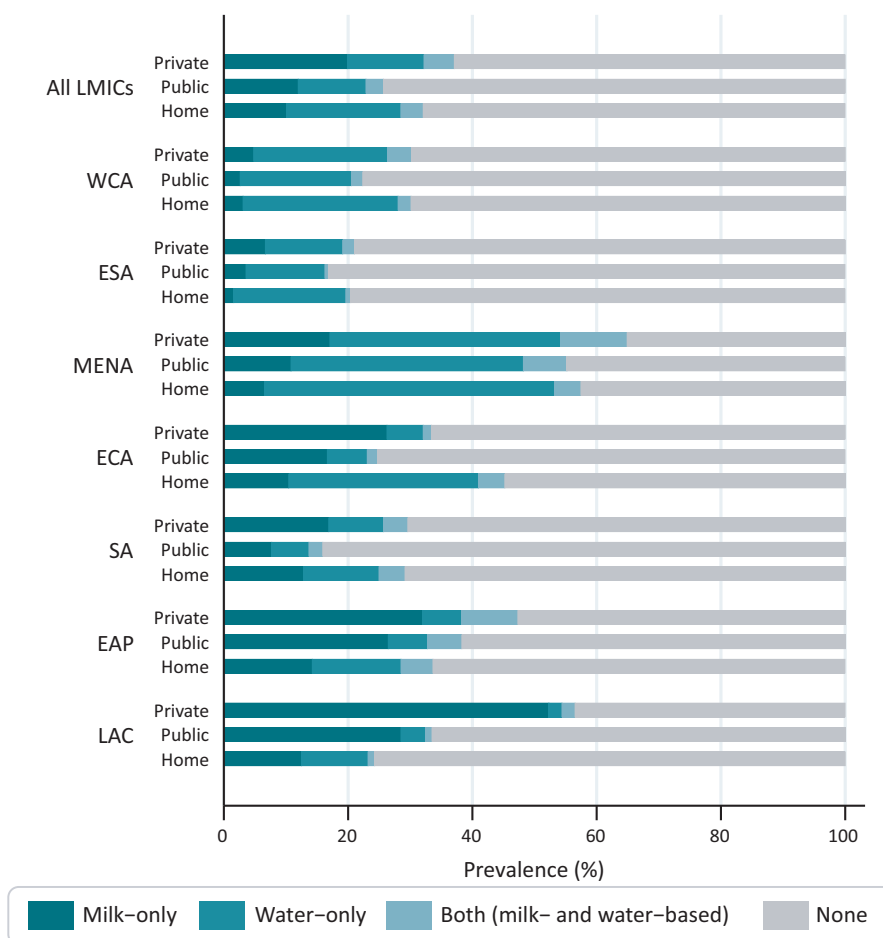
### 4.3 | Limitations of the data

The available data were collected retrospectively; thus, recall bias cannot be disregarded which can lead to spurious correlations. However, bias might be minimal as no child age-related pattern was found in the correlation analysis. A few more than 50% of upper-middle- and low-income countries had sufficient data to generate the estimates studied. There was a lack of data for countries with large populations of children under two years, such as Brazil and China. Our analyses were limited to milk-based and water-based prelacteals, as no information is available for other types of prelacteals in DHS/MICS surveys, like rice- or flour-based prelacteals. Finally, although it is clear that prelacteal feeds refer to early neonatal period, the operational definition of prelacteal feeding used in DHS/MICS surveys does not actually capture conceptual definitions previously used by WHO. Therefore, we acknowledge the importance of standardising the conceptual and operational definition(s) of prelacteal feeds that can be used in different types of studies.

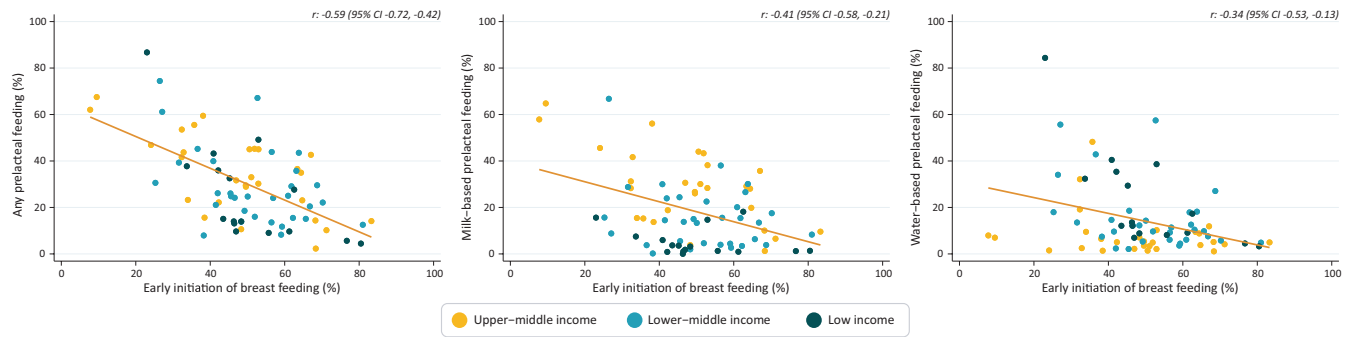
### 4.4 | Interpretation

Studies in Indonesia, Nepal and Pakistan using surveys of national representativeness reported that any prelacteal feeding is associated with family wealth, urban place of residence, births in private facilities, mother's education and delayed initiation of breast feeding.<sup>13,29,30</sup> We confirmed these earlier country studies and find that children from wealthier families born in private health settings were more likely to receive prelacteal feeds, especially milk-based types in Latin America & the Caribbean, Eastern Europe & Central Asia, and East Asia & Pacific. Wealthier women living in urban areas are prone to seek a private health facility for the delivery of their children. In these settings, formula companies lobby strongly to promote their products, by offering free samples to new parents that are potentially used by the infant's caregiver after hospital discharge. In response to the same marketing pressure, health professionals unnecessarily prescribe such products to newborns that can be breast-fed.<sup>31-34</sup>

We also confirmed the findings reported by Oakley et al.,<sup>19</sup> where early neonatal feeding practices were more common in facility births than home births, especially in Sub-Saharan Africa and South Asia. The percentage of children who did not receive any prelacteal was 47.2% in private facilities births compared to 65.3% in public facilities. In our study, the percentage was 62.9% for births in the private sector and 74.3% for public health facility births. This can be



**FIGURE 3** Share of the prevalence of types of prelacteal feeding by place of delivery, grouped by world region. Source: DHS and MICS, 2010–2019. EAP, East Asia & the Pacific; ECA, Eastern Europe & Central Asia; ESA, Eastern & Southern Africa; LAC, Latin America & the Caribbean; LMICS, low- and middle-income countries; MENA, Middle East & North Africa; SA, South Asia; WCA, West & Central Africa



**FIGURE 4** Relationship between the national prevalence of prelacteal feeding and the prevalence of early initiation of breast feeding by income groups.

Source: DHS and MICS, 2010–2019

**TABLE 1** Assessment of age-related recall bias in the correlation between national prevalence of early initiation of breast feeding and types of prelacteal feeding

Age (months)	Pearson's correlation (95% confidence interval)		
	Any prelacteal feeding	Milk-based prelacteal feeding	Water-based prelacteal feeding
0–5	–0.53 (–0.59, –0.46)	–0.38 (–0.46, –0.30)	–0.31 (–0.39, –0.22)
6–11	–0.56 (–0.62, –0.49)	–0.39 (–0.47, –0.31)	–0.32 (–0.40, –0.23)
12–17	–0.50 (–0.56, –0.42)	–0.37 (–0.44, –0.28)	–0.28 (–0.36, –0.19)
18–23	–0.48 (–0.55, –0.40)	–0.37 (–0.44, –0.28)	–0.26 (–0.34, –0.17)

Source: DHS and MICS, 2010–2019.

explained by the increasing number of caesarean deliveries between 2000 and 2015, mainly in low resource settings,<sup>35</sup> favouring immediate separation of mother–child dyad after birth.<sup>14</sup> Given that more women are giving birth in health facilities,<sup>36</sup> pro-breast-feeding policies must be prioritised to tackle unnecessary formula promotion and cultural barriers that promote prelacteal feeding and hamper early implementation of breast feeding soon after a child's birth in health facilities.

UNICEF and WHO jointly promote early initiation of breast feeding as a lifesaving strategy wherever a child is delivered. In 1991, early initiation of breast feeding was included in the Ten Steps to certify health facilities as Baby-Friendly. However, only 55% of countries (out of 117) in 2016/2017 included the Ten Steps into national policies, strategies or plans. Additionally, only 10% of births occurred in facilities that have been designated or re-assessed as 'Baby-friendly' between 2011/12 and 2016/17.<sup>3,37,38</sup> In 2017, many LMICs had fewer than 20% or no births occurring in a Baby-Friendly health facility, particularly in Sub-Saharan Africa and South Asia, where newborns would most benefit from early initiation of breast feeding. This is concerning because countries with high rates of births in Baby-friendly hospitals (>50%) were among the ones with higher early initiation of breast feeding rates in our analysis, such as Turkey, Ukraine and Kazakhstan (>65%).<sup>38</sup>

The lack of training on early initiation of breast feeding among health workers hampers progress on adherence to recommended early feeding practices. Indeed, a systematic review of studies conducted between 1992 and 2010 in all world regions showed

that theoretical and practical training tailored to doctors, nurses, midwives and home visitors was effective in improving early breast-feeding practices.<sup>39</sup> In South Sudan, a hospital-based intervention with health workers revealed large improvements in the prevalence of early initiation of breast feeding, increasing from 48.1% in 2016 to 90.8% in 2018, after health workers' training, even among mothers who delivered by caesarean delivery (3% in 2016 to 60% in 2018). In the same study, less than 2% of children received prelacteal feed after the intervention compared to 16% before.<sup>40</sup>

Other barriers to proper implementation of early initiation of breast feeding include some cultural norms and traditions that value feeding other foods or liquids (water, tea, sugar water, honey, etc.) rather than breast milk to newborns.<sup>37</sup> For example, in India prelacteal feeding can include honey, jaggery (brown sugar from sugar cane), ghee (clarified butter) and ghutti (herbal paste).<sup>17</sup> In addition, in some places, colostrum is believed to be dangerous to babies and is discarded.<sup>37,41</sup> Whereas milk-based prelacteals are often introduced in response to self-reported insufficient milk and in some instances for medical reasons, water-based prelacteals can be given for biomedical (in-hospital glucose water), perception of infant thirst and/or ritualistic reasons (intestinal cleansing with herbal concoctions and first sweet taste with honey drops).<sup>17,42</sup> Ritualistic prelacteals, which are fed in very small quantities or in just a few occasions, may be herbal-based prepared (e.g. cumin, cardamom and nutmeg) and offered by a person who has a special status within the family or community.<sup>17</sup> We are unaware of specific cultural belief norms that incentivise

milk-based prelacteals as a replacement for human milk calling for more research in this area.

Our regional analysis supports contrasting prelacteal scenarios perhaps as a function of health care systems access and obstetric practices. All African regions, where many births still occur outside a health facility, displayed a higher prevalence of water-based prelacteal feeding. Nevertheless, in regions such as Latin America & the Caribbean and Eastern Europe & Central Asia, where institutional deliveries rates are over 85% and caesarean delivery rates are high,<sup>35</sup> milk-based prelacteals prevailed.

## 5 | CONCLUSIONS

Despite the benefits associated with early initiation of breast feeding in preventing neonatal mortality, our results show that half of children in LMICs are not put to the breast within the first hour after birth. There is a large body of evidence indicating that optimal breast-feeding practices need to start right after childbirth, regardless of the place of delivery. We expect that this work will raise consciousness among key decision-makers about the urgent need to prevent the introduction of unnecessary prelacteal feeds globally. More work is needed regarding the promotion and protection of early initiation of breast feeding in order to achieve the Sustainable Development Goal to 2030 to reduce neonatal mortality below 12 deaths per 1000 live births.<sup>3</sup>

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## ETHICS APPROVAL

This study is based on publicly available deidentified data sets; hence, it did not require ethics approval from an Institutional Review Board.

## AUTHOR CONTRIBUTIONS

PARN performed the analysis with technical support from JSV, LICR, and NNAP. All authors interpreted the results. PARN, AJDB, and RPE wrote the manuscript with critical review from LR. All authors contributed to the discussion section. All authors read and approved the submitted version of the article.

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#### SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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