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Formula feeding practice among mothers with infants aged 0–5 months in Afghanistan: prevalence and associated factors

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Abstract

Exclusive breastfeeding is vital for infant health, yet reliance on formula feeding is rising globally. In Afghanistan, evidence on the prevalence and determinants of formula feeding is limited. This study aimed to estimate the prevalence of formula feeding among infants aged 0–5 months and to identify associated factors. This study utilized data from the 2022–2023 Afghanistan Multiple Indicator Cluster Survey (MICS), including 3,873 weighted mother-infant dyads. The outcome variable in this study was any formula feeding, defined as the proportion of infants aged 0–5 months who were fed formula in the past 24 h. Bivariate and multivariable logistic regression analyses were employed to identify factors associated with formula feeding. The prevalence of formula feeding was 9.2% (95%CI: 7.6–10.8%). The likelihood of infant formula feeding was significantly higher in infants aged 4–5 months (AOR = 1.59, 95%CI: 1.01–2.53); in infants who received prelacteal feeding (AOR = 1.94, 95%CI: 1.38–2.72); in infants whose mothers were aged 30–39 years (AOR = 1.46, 95%CI: 1.00–2.12); in infants from the Southern East (AOR = 4.59, 95%CI: 2.40–8.76), South (AOR = 2.35, 95%CI: 1.15–4.81) and West (AOR = 3.71, 95%CI: 1.57–8.76) regions. Nearly one in ten Afghan infants under six months are formula-fed. Interventions, particularly those addressing prelacteal feeding and region-specific vulnerabilities, are needed to safeguard exclusive breastfeeding and improve infant nutrition in Afghanistan.

Keywords Afghanistan, Formula feeding, Infant and young child feeding, National data

1 Introduction

Infant formula is a breast milk substitute formulated industrially for infants up to six months of age, typically prepared for bottle-feeding or cup-feeding from powder or liquid [1]. Although recommended in limited circumstances, such as when maternal illness prevents safe breastfeeding, formula is increasingly used worldwide as an alternative to breast milk. Medical indications for breast-milk substitutes are rare and limited to a small number of conditions, such as certain infant metabolic disorders (e.g., classic

galactosemia) and severe maternal illness or contraindicated medications [2, 3]. However, most early formula use reflects non-medically indicated supplementation driven by perceived milk insufficiency, feeding difficulties, or social and commercial influences [2, 3]. This trend raises concern, as breastfeeding remains the optimal feeding practice for infants, providing complete nutrition and protection against illness while also conferring maternal health benefits [4–6].

The World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) advocate for exclusive breastfeeding for the first six months of an infant's life, followed by the introduction of complementary foods alongside continued breastfeeding until 23 months [7]. These recommendations are particularly critical in humanitarian settings such as Afghanistan, where fragile maternal and newborn health services, unsafe water, limited sterilization, and disrupted supply chains make unnecessary formula use especially risky [8, 9]. The Operational Guidance on Infant and Young Child Feeding in Emergencies (IYCF-E) guidance prioritizes protection of exclusive breastfeeding and discourages untargeted promotion or distribution of breast-milk substitutes outside strict, case-by-case assessment and monitoring [10]. Although effective implementation of the International Code of Marketing of Breast-milk Substitutes protects against inappropriate formula use, limited enforcement in Afghanistan allows promotion through health facilities, mass media, and informal or digital channels that may influence caregivers' feeding decisions and undermine confidence in breastfeeding [11]. This initial period of exclusive breastfeeding is vital for a child's growth and overall well-being, as breast milk delivers complete and essential nutrition [12]. Additionally, breastfeeding offers protective health benefits to mothers, reducing the risk of complications such as postpartum bleeding and certain cancers while postponing subsequent pregnancies [13–15]. Despite these benefits, there is a troubling trend of decreasing exclusive breastfeeding rates, with many caregivers turning to formula, plain water, fruit juices, and local homemade foods [16–18].

Worldwide, approximately 40% of mothers had started using breast milk substitutes by the time their infants were 8 weeks old, and the majority were mixing breast milk with breast milk substitute before their babies turned 6 months [7]. Only 40% of mothers worldwide exclusively breastfeed their infants for the first six months [19]. Exclusive breastfeeding rates are notably low in the developing world, especially in West and Central Africa, which also experience some of the highest levels of infant malnutrition globally. In Sub-Saharan Africa, the prevalence of exclusive breastfeeding stands at 35%, which is lower than the 39% seen in other low and middle-income countries [20, 21]. In contrast, Afghanistan reports a much higher rate of exclusive breastfeeding at 67% [9], though this figure may mask underlying disparities in formula use.

Formula feeding can lead to adverse health outcomes for infants, primarily due to its higher protein content compared to breast milk. This increased protein contributes to faster growth and greater fat accumulation in formula-fed infants, raising their risk of obesity and associated health issues [22]. Formula-fed infants are also more susceptible to allergies, infections, and sudden infant death syndrome (SIDS), as well as long-term conditions such as asthma, diabetes, and leukemia. Cognitive development may also be negatively affected [23–26]. Multiple factors have been identified as influencing the decision to formula feed. These include maternal occupation, educational level, health status, mode of delivery, attitudes towards formula, milk advertising, and economic

considerations [21, 24, 27–29]. In some households, animal milk is used as a substitute for formula; however, it is not recommended for infants under six months due to nutritional inadequacy and infection risk [8, 9, 30].

Since August 2021, Afghanistan's health system has faced major disruptions due to economic decline, reduced international funding, and constrained donor support, affecting the availability and quality of maternal and child health services [31, 32]. In addition, female healthcare providers have encountered increased restrictions on mobility, education, and professional practice, which may further limit access to maternal and child health services [31], and degrade the quality and availability of breastfeeding support. Afghanistan's ongoing nutrition crisis affects millions, with 2025 estimates projecting 3.5 million malnourished children under five and over one million malnourished pregnant or breastfeeding women [33, 34]. Such widespread undernutrition may lead some mothers to perceive breast milk as insufficient, increasing the likelihood of formula feeding in already resource-limited settings.

Despite the global attention on breastfeeding promotion, there is limited evidence on the specific determinants of formula feeding in Afghanistan. Therefore, this study aims to estimate the prevalence and associated factors of formula feeding practice among mothers with infants aged 0–5 months in Afghanistan. Understanding the drivers of formula feeding is essential to inform evidence-based policies, strengthen breastfeeding protection, and mitigate nutrition-related risks in fragile settings. Addressing these gaps is critical for improving maternal and child health outcomes and advancing progress toward Sustainable Development Goal 3 (SDG 3).

2 Methods

2.1 Study design and data source

This was a cross-sectional study, for which data from the Afghanistan Multiple Indicator Cluster Survey (MICS) 2022-23 were used. MICS data were accessed on August 01, 2025. The Afghanistan MICS 2022-23 used a two-stage sampling design. Details on the sampling approach and data collection are reported as part of the Afghanistan MICS 2022-23 report [35]. During the MICS survey, trained surveyors interviewed women, using a questionnaire on the use of maternal and child healthcare. Data from a total of 32,989 children, aged 0–59 months, were collected. For this study, we analyzed data from 3,866 infants, aged 0–5 months, and their mothers (Fig. 1).

3 Study variables

3.1 Outcome variable

The outcome variable was any formula feeding, and it was defined as whether the infant was given formula milk within the past 24 h. The response options were "yes", "no", and "don't know". We created a binary variable for the outcome (yes vs. no) and used it in a binary logistic regression model. Data on the response option "don't know" were dropped from the analysis. We restricted the data analysis to infants aged 0–5 months.

3.2 Independent variables

The independent variables included were mother's age at time of survey (15–29, 30–39, and 40–49 years), mother's education level (no formal education, primary education, and secondary or higher education), education level of the head of household (no formal

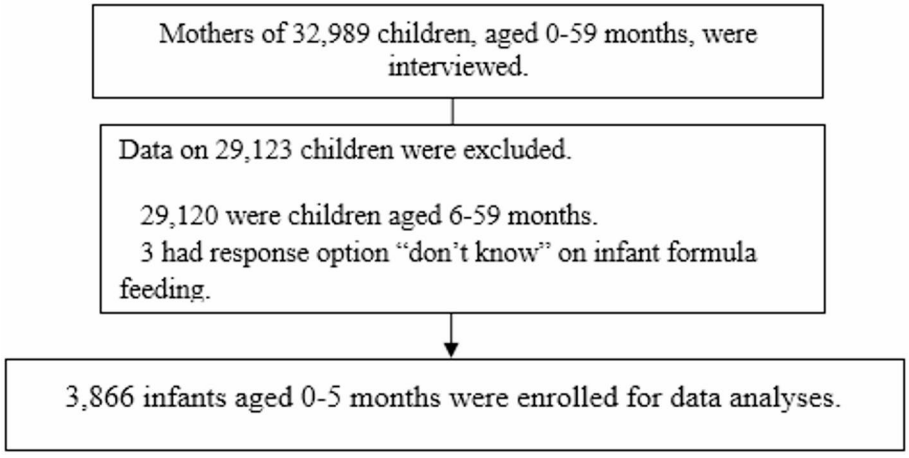

Fig. 1 Final sample size and schematic presentation of the sample selection

education, primary education, and secondary or higher education), household wealth status [lowest quintile (poorest) up to highest quintile (richest)], regions of Afghanistan (Central, Central high, East, East north, East south, North, South, West), residential area (urban vs. rural), postnatal breastfeeding counselling was provided to the mother within 2 days after birth (yes vs. no), antenatal care (ANC) use, defined as "no visit" "1–3 visits" and "≥ 4 visits", place of delivery (home, public health facility, private health facility), birth order (1st child vs. 2nd or higher), age of infant (0–1 months, 2–3 months, 4–5 months), sex of infant (boy vs. girl), very small size baby (yes vs. no), prelacteal feeding (yes vs. no), C-section (yes vs. no), access to the internet (yes vs. no), and media exposure (yes vs. no). Media exposure was defined as "yes" if the mother watched TV at least once a week, or the mother listened to the radio at least once a week, and "no" otherwise. Access to the internet was used as a proxy for social media exposure and was defined as "yes" if the mother used the internet at least once a week in the last 3 months, and "no" otherwise.

3.3 Statistical analysis

Descriptive statistics were used to describe the characteristics of the study population. The chi-square test was applied to assess the relationship between categories of independent variables and the infant formula feeding status. Bivariate and multivariable binary logistic regression models were conducted to examine the likelihood of use of infant formula feeding across the categories of independent variables. Based on prior literature [17, 21, 24, 36–38], variables considered conceptually relevant were examined in bivariate analyses. For multivariable model building, independent variables with a p-value < 0.25 in any category in the bivariate logistic regression were retained, consistent with recommended purposeful selection strategies in epidemiologic research [39, 40]. This approach allows inclusion of potentially important confounders that may not demonstrate statistical significance in unadjusted analyses. Crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were provided, using the bivariate and multivariable logistic regression analyses. Survey design features, including stratification, clustering, and sampling weights, were accounted for in all analyses using the survey (svy) commands in Stata. The survey design was specified as: svyset PSU, strata(stratum)

weight(chweight) vce(linearized) singleunit(certainty). Data analysis was performed using STATA version 18 [41]. Statistical significance was set at a p-value < 0.05.

4 Results

Table 1 presents baseline characteristics of 3,866 infants and their mothers, corresponding to a weighted sample of 3,873 individuals. The distribution of key characteristics was comparable between the unweighted and weighted samples, indicating minimal distortion introduced by survey weighting. For example, nearly two-thirds of mothers were aged 15–29 years (65.2% in the unweighted sample and 65.4% in the weighted sample). Similarly, mothers aged 30–39 years accounted for 28.8% of the unweighted sample and 29.0% of the weighted sample, while those aged 40–49 years represented 6.0% and 5.6%, respectively (Table 1).

Figure 2 illustrates the weighted prevalence of formula feeding among infants aged 0–5 months, which was 9.2% (95% CI: 7.6%–10.8%). Regional variations in formula feeding prevalence are also shown in Fig. 2.

Table 2 presents crude and adjusted ORs on infant formula feeding. The likelihood of infant formula feeding was significantly higher in infants aged 4–5 months (AOR = 1.59, 95%CI: 1.01–2.53); in infants who received prelacteal feeding (AOR = 1.94, 95%CI: 1.38–2.72); in infants whose mothers were aged 30–39 years (AOR = 1.46, 95%CI: 1.00–2.12); in infants from the Southern East (AOR = 4.59, 95%CI: 2.40–8.76), South (AOR = 2.35, 95%CI: 1.15–4.81) and West (AOR = 3.71, 95%CI: 1.57–8.76) regions compared to those from the Central region.

5 Discussion

This study provides the first national-level evidence on formula feeding practices among Afghan mothers with infants under six months of age. We found that 9.2% of infants were formula fed, a prevalence lower than in many other low- and middle-income countries (LMICs) but still a cause for concern given the nutritional vulnerabilities in Afghanistan. Several factors, including the mother's and infant's ages, prelacteal feeding practices, and residential region, were significantly associated with formula feeding.

The prevalence of formula feeding in Afghanistan (9.2%) is comparable to the global estimate of 11.6% among infants aged 0–5 months [42]. However, this rate is considerably lower than the rates reported in other LMICs, such as 17.1% in Sub-Saharan Africa [24], 34.0% in Ethiopia [38], and 32.2% in India [43]. To our knowledge, this is the first study to document national-level prevalence in Afghanistan [8]. Earlier analyses of the same survey data reported a relatively high rate of exclusive breastfeeding (67%) [9], a finding likely supported by strong cultural and religious norms that promote breastfeeding [9, 44]. In some rural areas, families also substitute animal milk rather than purchase commercial formula, which may further limit uptake [44]. However, this practice carries important health risks, as animal milk is not recommended for infants under six months due to inadequate nutrient composition and increased susceptibility to infection [45]. While these factors may partly explain the comparatively low prevalence of formula feeding, the presence of socio-demographic and health system determinants identified in this study points to emerging vulnerabilities. Unless addressed, these gaps could undermine Afghanistan's progress toward achieving SDG 3.2 (ending preventable deaths of newborns and children under five) and SDG 2.2 (ending all forms of malnutrition).

Table 1 Baseline characteristics of the mother-infant dyads

Characteristics	Unweighted *n* = 3,866 *n* (%)	Weighted *n* = 3,873 *n* (%)
Mother's age		
15–29	2,521 (65.2)	2532 (65.4)
30–39	1,113 (28.8)	1124 (29.0)
40–49	232 (6.0)	217 (5.6)
Mother's education		
No formal education	3,116 (80.6)	3001 (77.5)
Primary	323 (8.3)	380 (9.8)
Secondary/higher	427 (11.1)	492 (12.7)
Household head's education		
No formal education	2,492 (64.5)	2401 (62.0)
Primary	406 (10.5)	478 (12.3)
Secondary/higher	968 (25.0)	994 (25.7)
Residential area		
Urban	559 (14.5)	844 (21.8)
Rural	3,307 (85.5)	3029 (78.2)
Antenatal care (ANC) utilization		
No visit	961 (24.9)	802 (20.7)
1–3 visits	1,725 (44.6)	1751 (45.2)
≥ 4 visits	1,180 (30.5)	1321 (34.1)
Place of delivery		
Home	1,314 (34.0)	1215 (31.4)
Public health facility	2,285 (59.1)	2232 (57.6)
Private health facility	267 (6.9)	426 (11.0)
Sex of the infant		
Male	1,975 (51.1)	2033 (52.5)
Female	1,891 (48.9)	1840 (47.5)
Age of the infant		
0–1 months	1,438 (37.2)	1425 (36.8)
2–3 months	1,249 (32.3)	1301 (33.6)
4–5 months	1,179 (30.5)	1146 (29.6)
Birth order		
1 st child	694 (18.0)	697 (18.0)
2nd or higher child	3,172 (82.0)	3176 (82.0)
Postnatal breastfeeding counselling		
Not received	833 (21.6)	836 (21.6)
Received	3,033 (78.4)	3036 (78.4)
Prelacteal feeding (PLF)		
Not received	2,562 (66.3)	2432 (62.8)
Received	1,304 (33.7)	1445 (37.2)
Very small-sized baby		
No	3,381 (87.5)	3304 (85.3)
Yes	485 (12.5)	569 (14.7)
C-section		
No	3,702 (95.8)	3644 (94.1)
Yes	164 (4.2)	229 (5.9)
Mother's access to media (TV and Radio)		
No	3,270 (84.6)	3153 (81.4)
Yes	596 (15.4)	720 (18.6)
Mother's access to the internet (proxy for social media)		
No	3,670 (94.9)	3678 (95.0)
Yes	196 (5.1)	195 (5.0)
Wealth index		

Table 1 (continued)

Characteristics	Unweighted *n* = 3,866 *n* (%)	Weighted *n* = 3,873 *n* (%)
Lowest quintile (poorest)	740 (19.1)	727 (18.8)
Second	880 (22.8)	818 (21.1)
Third	903 (23.4)	784 (20.2)
Fourth	801 (20.7)	858 (22.2)
Highest quintile (richest)	542 (14.0)	686 (17.7)
Regions of Afghanistan		
Central	619 (16.0)	645 (16.7)
Central high	146 (3.8)	102 (2.6)
East	533 (13.8)	450 (11.6)
Southern East	610 (15.8)	399 (10.3)
Northern East	375 (9.7)	483 (12.5)
North	490 (12.7)	559 (14.4)
South	731 (18.9)	766 (19.8)
West	362 (9.4)	469 (12.1)

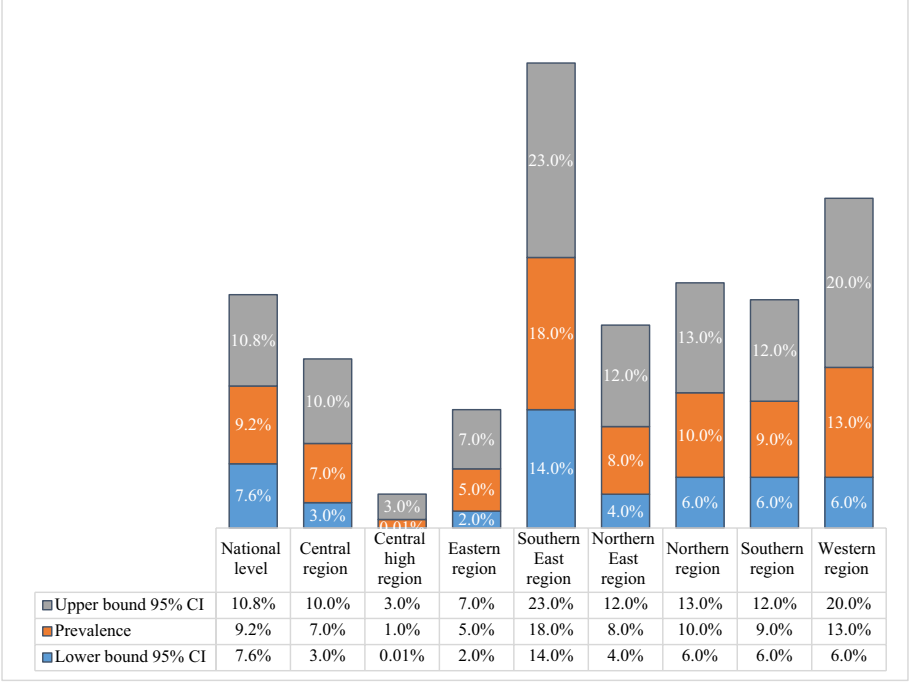

Fig. 2 Weighted prevalence of infant formula feeding practice among infants aged 0–5 months by different regions of Afghanistan

Thus, maintaining high levels of exclusive breastfeeding while curbing inappropriate formula use should remain a national priority. Without targeted interventions, the identified gaps may contribute to higher risks of malnutrition, infection, and infant mortality, hindering SDG attainment.

We found that the mother's age was positively associated with formula feeding practice. Infants whose mothers were aged 30–39 years were more likely to practice formula feeding than those whose mothers were aged 15–29 years. This finding is consistent with some studies conducted in LMICs [17, 24]. The higher likelihood of infant formula feeding among mothers aged 30–39 years may be partly explained by reduced breastfeeding

Table 2 Likelihood of formula feeding among infants aged 0–5 months

Characteristics	Crude odds ratio (95%CI)	*P*-Value	Adjusted odds ratio (95%CI)	*P*-Value
Mother's age (years)				
15–29	Reference		Reference	
30–39	1.28 (0.85–1.93)	0.229	1.46 (1.00–2.12)	0.049
40–49	0.82 (0.40–1.69)	0.594	0.94 (0.44–2.02)	0.878
Mother's education				
No formal education	Reference		Reference	
Primary	1.15 (0.64–2.05)	0.640	1.09 (0.58–2.03)	0.790
Secondary/higher	2.01 (1.12–3.60)	0.019	1.48 (0.83–2.64)	0.190
Household head education				
No formal education	Reference		Reference	
Primary	1.42 (0.81–2.49)	0.220	1.43 (0.80–2.55)	0.227
Secondary/higher	1.64 (1.04–2.58)	0.034	1.38 (0.88–2.15)	0.157
Residential area				
Urban	Reference		Reference	
Rural	0.56 (0.35–0.89)	0.014	0.93 (0.58–1.48)	0.752
Antenatal care (ANC) utilization				
No visit	Reference		Reference	
1–3 visits	1.51 (0.87–2.61)	0.14	1.06 (0.60–1.87)	0.844
≥ 4 visits	2.20 (1.23–3.95)	0.01	1.49 (0.81–2.71)	0.197
Place of delivery				
Home	Reference		Reference	
Public health facility	1.86 (1.16–2.99)	0.010	1.49 (0.89–2.48)	0.129
Private health facility	2.64 (1.27–5.50)	0.009	1.46 (0.75–2.85)	0.271
Sex of infant				
Male	Reference		Reference	
Female	1.25 (0.89–1.73)	0.193	1.23 (0.87–1.73)	0.238
Age of the infant				
0–1 months	Reference		Reference	
2–3 months	1.22 (0.73–2.03)	0.451	1.43 (0.90–2.27)	0.132
4–5 months	1.40 (0.86–2.29)	0.176	1.59 (1.01–2.53)	0.048
Birth order				
1 st child	Reference		–	–
2nd or higher child	0.93 (0.60–1.44)	0.734	–	–
Postnatal breastfeeding counselling				
Not received	Reference		–	–
Received	0.99 (0.64–1.53)	0.976	–	–
Prelacteal feeding (PLF)				
Not received	Reference		Reference	
Received	2.36 (1.65–3.37)	< 0.001	1.94 (1.38–2.72)	< 0.001
Very small-sized baby				
No	Reference		–	–
Yes	1.06 (0.67–1.68)	0.802	–	–
C-section				
No	Reference		–	–
Yes	0.94 (0.48–1.85)	0.868	–	–
Mother's access to media (TV and Radio)				
No	Reference		Reference	
Yes	2.07 (1.39–3.06)	< 0.001	1.43 (0.92–2.21)	0.112
Mother's access to the internet (proxy for social media)				
No	Reference		Reference	
Yes	1.60 (0.87–2.97)	0.133	0.79 (0.35–1.79)	0.567
Wealth index				
Lowest quintile	Reference		Reference	

Table 2 (continued)

Characteristics	Crude odds ratio (95%CI)	*P*-Value	Adjusted odds ratio (95%CI)	*P*-Value
Second	1.03 (0.53–1.99)	0.931	1.03 (0.53–2.01)	0.926
Third	0.94 (0.44–2.03)	0.875	0.74 (0.34–1.61)	0.448
Fourth	1.74 (0.89–3.42)	0.107	1.22 (0.62–2.37)	0.569
Highest quintile	3.30 (1.63–6.68)	0.001	1.70 (0.83–3.48)	0.148
Regions of Afghanistan				
Central	Reference		Reference	
Central high	0.20 (0.06–0.68)	0.01	0.34 (0.09–1.21)	0.095
East	0.70 (0.32–1.51)	0.36	1.10 (0.51–2.37)	0.806
Southern East	3.22 (1.72–6.01)	< 0.001	4.59 (2.40–8.76)	< 0.001
Northern East	1.18 (0.54–2.60)	0.68	1.78 (0.80–3.96)	0.156
North	1.53 (0.78–2.97)	0.21	1.87 (0.89–3.92)	0.097
South	1.43 (0.72–2.83)	0.30	2.35 (1.15–4.81)	0.020
West	2.13 (0.92–4.94)	0.08	3.71 (1.57–8.76)	0.003

The crude and adjusted odds ratios were obtained, using the sample estimation based on sample weight

support and age-related social and family dynamics [8]. Women in this age group may receive less targeted breastfeeding counseling from health providers and family members, particularly when they are perceived as experienced mothers [46, 47]. In addition, these mothers are often heavily engaged in household responsibilities and childcare for multiple children, limiting the time and privacy needed for breastfeeding [31]. Furthermore, in contexts where women marry at a young age, the large age gap between the first child and the current infant may result in older children assuming caregiving roles, including feeding, which can increase reliance on formula feeding [48]. These results underscore the need for tailored communication strategies that address appropriate IYCF practices in Afghanistan, particularly among middle-aged women.

Formula feeding increased with infant age, particularly after three months of life, a pattern also reported in other low- and middle-income settings, such as Pakistan [18] and Ethiopia [36], where caregivers often introduce formula when breastfeeding patterns change and are perceived as insufficient [49, 50]. Evidence shows that after the first two to three months, breastfeeding infants feed less frequently but more efficiently, a normal developmental shift that may be misinterpreted as declining milk supply [44, 50]. In the Afghan context, a lack of postpartum lactation support or accurate information may exacerbate this issue. If mothers do not understand that decreased feeding frequency is part of normal maturation, they may resort to formula prematurely. These findings underscore the need for enhanced breastfeeding support during critical windows, especially around 2–3 months postpartum, focusing on normal feeding patterns, reinforcing maternal confidence, and mitigating unnecessary formula use.

Prelacteal feeding was independently associated with higher odds of formula feeding, consistent with evidence from other LMICs [51–53]. Research has shown that prelacteal feeding practice can adversely affect neonatal health and survival. Prelacteal feeding deprives infants of colostrum, which offers significant immunological and nutritional benefits, and increases the risk of infection, malnutrition, and delayed initiation of breastfeeding [51, 52]. Nonetheless, no study has reported on the magnitude of prelacteal feeding practice in Afghanistan. Hence, further studies are warranted to determine the prevalence and determinants of prelacteal feeding in this setting, ensuring that breastfeeding practices are evidence-based, consistent, and free from cultural and traditional influences. Additionally, training midwives, community health workers, and

facility staff in early breastfeeding initiation, alongside monitoring the fidelity of counselling practices, could help prevent prelacteal feeding practices. Expanding community-based educational programs may also be especially valuable in Afghanistan, where cultural and religious beliefs surrounding IYCF practices are prevalent [8, 9, 54, 55].

We also observed that formula feeding practices were uneven, with significant regional disparities. The odds of formula feeding were higher among infants living in the Southern East, South, and West regions than among those living in the Central region. Research in LMICs has also shown regional disparities in formula feeding practices between and within countries [56, 57]. The regional disparities observed in the current study may help inform targeted interventions and strategies to improve IYCF practices in specific regions. However, further research into factors contributing to this regional disparity is needed to ascertain the design of policy responses and interventions.

5.1 Policy implications

To reduce inappropriate formula use and strengthen exclusive breastfeeding in Afghanistan, coordinated policy and programmatic actions are needed. First, stronger enforcement of the International Code of Marketing of Breast-Milk Substitutes (WHO Code) is essential to prevent inappropriate promotion of formula and related products that undermine breastfeeding practices, particularly through health facilities and media channels [58, 59]. Second, requiring Baby-Friendly Hospital Initiative (BFHI) compliance in both public and private maternity facilities could improve early initiation and continuation of breastfeeding by institutionalizing evidence-based maternity care practices [60]. Third, training midwives, nurses, and community health workers in lactation counselling and management should be prioritized to address breastfeeding challenges and counter misconceptions about milk insufficiency. Fourth, regulating mass and digital media advertising of breast-milk substitutes is increasingly important, as digital marketing has been shown to influence infant feeding decisions and weaken adherence to breastfeeding recommendations [58, 59]. Finally, strengthening community-based breastfeeding support structures, including mother-to-mother support groups and community outreach, can reinforce breastfeeding norms beyond health facilities and sustain practices during the postpartum period.

5.2 Limitations

Our study has some limitations. First, formula feeding in MICS was measured using the 24-hour recall method, which might have underestimated the exact extent of formula feeding practice in the study. Nonetheless, this is the most common method employed in national surveys across LMICs [17, 24, 36, 38]. Second, data on formula feeding in the MICS survey were self-reported and are prone to information and social desirability biases, particularly in reporting culturally inappropriate behaviors such as formula feeding. Third, the data collected in the MICS survey restricted our analysis to available variables. Therefore, future studies should consider other significant predictors of formula feeding, including misconceptions, breastfeeding intention, therapeutic use of formula, exposure to breast-milk substitutes marketing, maternal perceptions of milk sufficiency, infant morbidity, attitude toward formula feeding, knowledge of formula feeding, and cultural beliefs, in their analysis [24, 36, 38]. In addition, other dimensions of formula use, including seasonal variation and the duration or frequency of formula

feeding, were not captured in the dataset. Lastly, the cross-sectional nature of the study precludes causal inference regarding the association between the factors and formula feeding practice.

6 Conclusion

This study found that nearly one in ten infants under six months of age in Afghanistan were fed formula, highlighting a persistent risk to optimal infant feeding in a fragile health and nutrition context. Formula feeding was more likely among older infants, those who received prelacteal feeding, infants born to mothers aged 30–39 years, and those residing in the Southern East, South, and West regions. These findings indicate that formula feeding in Afghanistan is shaped by a combination of early feeding practices, maternal characteristics, and regional disparities. Strengthening breastfeeding protection through targeted, evidence-based interventions, particularly those addressing prelacteal feeding and region-specific vulnerabilities, is essential to safeguard exclusive breastfeeding and improve infant nutrition outcomes.

Abbreviations

AOR	Adjusted odds ratio
BFHI	BabyFriendly Hospital Initiative
CI	Confidence interval
IYCF	Infant and young child feeding
LMICs	Low and middleincome countries
MICS	Multiple Indicator Cluster Survey
OR	Odds ratio
PNC	Postnatal care
SDG	Sustainable development goal
SIDS	Sudden infant death syndrome
UNICEF	United Nations International Childrens Emergency Fund
WHO	World Health Organization

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Author contributions
Conceptualization and design: MHS and ET. Analysis: ET and MHS. Writing- original draft: MHS, ET, ZE, FD, and MJ. Writing-review & editing: ET, MHS, FD, MJ, HS, and OD. All authors have read and approved the final manuscript.

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Data availability
The MICS 2022-23 dataset is publicly available on UNICEF's official website through the following link: https://mics.unicef.org/surveys

Declarations

Ethics approval and consent to participate
The Research and Ethics Committee of the Department of Public Health, Faculty of Medicine at Kandahar University waived the requirement for ethical approval, as this study involved the use and analysis of secondary data from the MICS 2022–2023. The MICS survey was approved by Afghan Ministry of Public Health and UNICEF. In the original MICS survey, informed consent was obtained from all participants prior to the interviews, and for children, consent was provided by their legal guardians. Additionally, all procedures adhered to the principles outlined in the Declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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