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Exclusive breastfeeding and its associated factors among children aged 0–5 months in Sierra Leone: a multilevel analysis

Alieu Tommy[1,2*], Augustus Osborne[3], Ola Farid Jahanpour[4], Lovel Fornah[5,6], Joseph Sam Kanu[7,8] and Longying Zha[9*]

Abstract

Background Exclusive breastfeeding is a crucial public health intervention with significant benefits for infants and maternal health. In Sierra Leone, despite national efforts to promote exclusive breastfeeding, prevalence remains suboptimal. Understanding the factors influencing exclusive breastfeeding practices among children aged 0–5 months is essential for developing effective interventions to increase exclusive breastfeeding rates. This study examined the sociodemographic, and healthcare-related factors associated with exclusive breastfeeding in Sierra Leone.

Methods Data from the 2019 Sierra Leone Demographic and Health Survey was used for the study. A mixed-effect multilevel binary logistic regression models was fitted to examine the factors associated with exclusive breastfeeding in Sierra Leone. The results were presented as adjusted odds ratios (aOR) with a 95% confidence interval (CI) and intra-cluster correlation coefficients.

Results The prevalence of exclusive breastfeeding among children aged 0-5 months was 54.1% (95% CI 50.2, 57.9) in Sierra Leone. Children aged 2–3 months (aOR 0.30; 95% CI: 0.20, 0.45) and 4–5 months (aOR 0.08; 95% CI: 0.05, 0.13) had lower odds of exclusive breastfeeding than those aged 0–1 months. Children of mothers with a history of skilled birth attendance (aOR 0.55; 95% CI: 0.32, 0.96) had lower odds of exclusive breastfeeding than those without skilled birth attendance. Children of mothers in rural areas (aOR 1.62; 95% CI: 1.03, 2.55) had higher odds for exclusive breastfeeding than those in urban areas.

Conclusion The findings suggest a need for targeted interventions to improve exclusive breastfeeding rates, particularly for infants aged 2-5 months, where the odds are significantly lower. There is also a critical need to enhance postnatal care and education for mothers, especially those with skilled birth attendance, to ensure they receive adequate support for breastfeeding practices. Furthermore, leveraging the strengths observed in rural areas could inform community-based strategies that promote exclusive breastfeeding, highlighting the importance of culturally sensitive approaches that address the unique challenges faced by urban mothers.

*Correspondence:
Alieu Tommy
alieuktommy15@gmail.com
Longying Zha
lyzha@smu.edu.cn

Full list of author information is available at the end of the article

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Keywords Exclusive breastfeeding, Healthcare utilization, Infant and young child feeding, Sierra Leone, Sociodemographic factors

Background

Exclusive breastfeeding (EBF) is the practice of giving the baby only breast milk and no other liquids, foods, or even water aside from syrups or drops that include vitamins, minerals, supplements, or medications during the first six months of life [1–6]. As per the World Health Organization's recommendations, mothers should start breastfeeding their babies within an hour of giving birth, maintaining EBF coverage for six months, and then transition to safe, nutritious supplementary foods when their babies are two years old or older [4, 7–10].

Less than one-third of babies globally are nursed exclusively during the first four months of their lives [5]. Only 37% of infants under six months old in developing countries receive breast milk [4]. About 20% of women reported nursing their newborn exclusively in Sub-Saharan Africa [4]. In North Africa, the rate of EBF is 41%; in Asia, it is 44%; and in Latin America, it is 30% [1–5, 11].

EBF is a critical public health priority in Sierra Leone, where efforts have been made to improve breastfeeding rates over the past decade. The EBF practice has shown a steadily increasing trend in Sierra Leone. According to the 2019 Sierra Leone Demographic and Health Survey (SLDHS), the prevalence of EBF among infants aged 0–5 months increased from 32% in 2013 [12] to 54% in 2019 [13]. There is still room for improvement in breastfeeding practices, even with the recent expansion of EBF and the decrease in mortality among children under five. For the purpose of creating suitable and successful interventions meant to enhance child health, policymakers must have a thorough understanding of the factors that influence the practice [14]. Various studies in Southern Sierra Leone [14], Southern Ethiopia [15], Uganda [16], Japan [17] and Malaysia [18] have been carried out to acquire insights into the factors that influence breastfeeding behaviors. Exclusive breastfeeding practice variations are complex and have been attributed to many factors, including place of residence, gender of the child, child's age, mother's age, regional disparities, the woman's educational attainment, marital status at the time, family wealth index, place of delivery, the mother's occupation, religion, the mode of delivery, access to the media, antenatal care (ANC) visit, postnatal care (PNC) visit, birth order, the interval between the mother's first and second pregnancies, and desire to become pregnant [2, 3, 6, 7, 14, 15, 18–34]. Nevertheless, limited research has comprehensively explored the socioeconomic factors that influence breastfeeding in Sierra Leone, particularly through multilevel analytical approaches. Addressing this gap is essential for developing tailored interventions that promote EBF and improve child health outcomes. The study's hypothesis is that the likelihood of EBF among children in Sierra Leone between the ages of 0–5 months is significantly influenced by sociodemographic and healthcare-related factors. This study examined the factors influencing EBF among children aged 0–5 months in Sierra Leone.

Methods

Study settings

Sierra Leone is located in West Africa. On its northeast, southeast, and southwest borders, respectively, are Guinea, Liberia, and the Atlantic Ocean [30]. The country has a tropical climate and several types of terrain, including savannah and rainforests. The Eastern, Northern, North-Western, Southern, and Western Areas are Sierra Leone's five geographical areas. Rural areas make up the first four regions. The regions are made up of a total of 16 districts: 3 in the Eastern, 4 in the Northern, 3 in the North-Western, 4 in the Southern, and 2 in the Western Area. Of the 8,600,000 people living in Sierra Leone in 2022, 4,290,000 were women. Most people roughly 56.17% live in rural areas, while 43.83% do so in urban areas [20]. In 2022, the infant mortality rate in the nation was 76 per 1000 live births [20].

Data source

The study utilized cross-sectional data from 2019 SLDHS. The 2019 SLDHS is a nationwide survey that offers current data on health and demographic variables. Enumeration areas were used as the sampling units for the first stage of a stratified, two-stage cluster design that was used to choose the sample. In each of the 578 chosen enumeration areas, a comprehensive household listing was conducted as the second stage.

Study participants and sampling procedure

A total of 9,899 women between the ages of 15–49 for under 5 years of age children were interviewed for the 2019 poll, representing a 97% response rate. Figure 1 provides a graphic representation of the participants' flow. All 31 strata and 466/578 enumeration areas or clusters were used to select these infants. The analysis focused on 994 children aged 0–5 months residing with their mothers at the time of the survey.

Variables

Dependent variable

The dependent variable in this study was EBF, which was coded as a binary variable. Infants who were exclusively breastfed during the entire 24 h preceding the survey

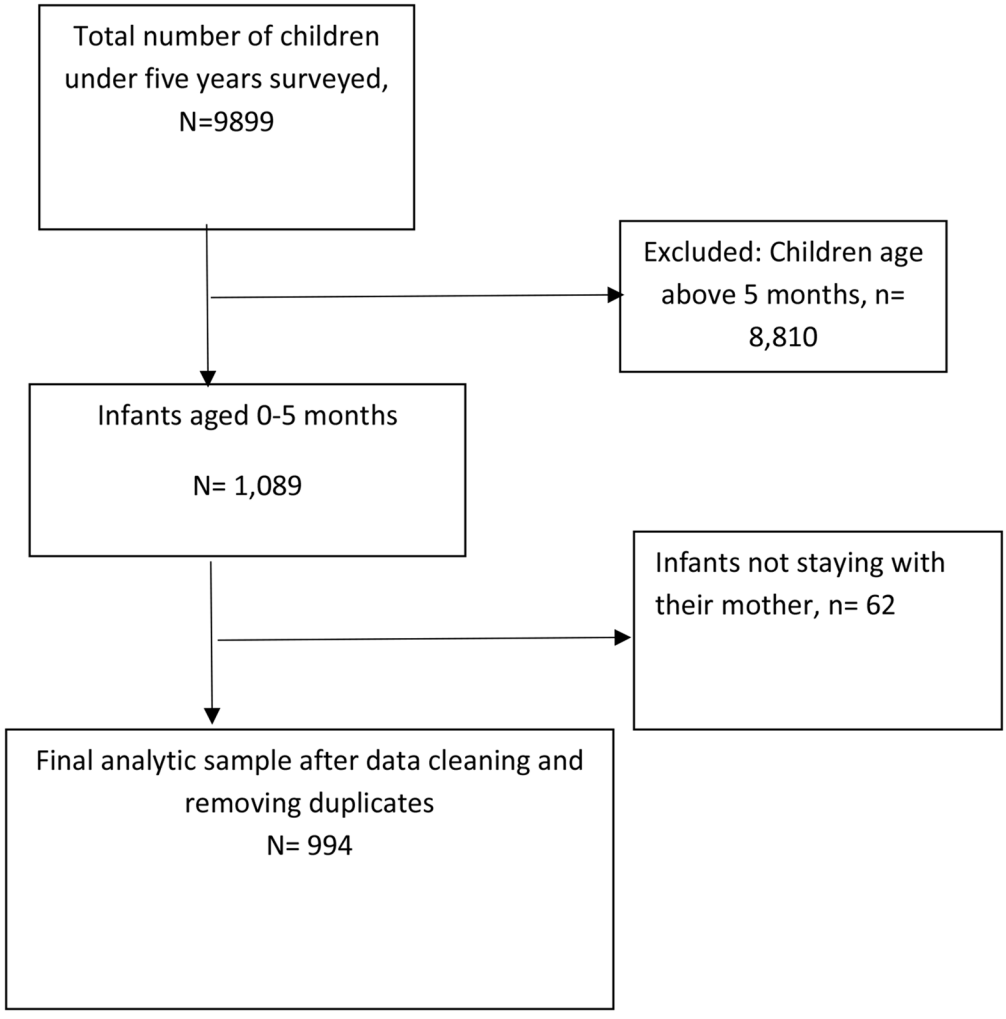

Fig. 1 Participants' flow

were coded as 1 ("Yes"). Exclusive breastfeeding was defined as feeding the infant only breast milk, with the exception of prescribed drugs, oral rehydration solution, vitamins, and minerals. Infants who received any substances other than breast milk (excluding the exceptions listed) during the same 24-hour period were coded as 0 ("No").

Independent variables

The independent variables included a range of factors identified from prior literature as potential influencers of EBF. These variables were recoded to ensure consistency and comparability. Child's age was categorized into three groups: 0–1 month, 2–3 months, and 4–5 months. Marital status was coded as a binary variable with two categories: "Never in union" and "Married/cohabiting." Educational attainment was categorized into four levels: "No education," "Primary," "Secondary," and "Higher." Employment status of the respondent was categorized as "Family-employed," "Self-employed," and "Not working." Religion was categorized as "Christians" and "Muslims," while the sex of the child was coded as a binary variable: "Male" and "Female."

Media exposure variables, such as listening to the radio and watching television, were categorized based on frequency: "Not at all," "Less than once a week," and "At least once a week." Literacy level was categorized into three groups: "Cannot read at all," "Able to read only parts of a sentence," and "Able to read the whole sentence." Place of delivery was coded as a binary variable: "Home" and "Health facility." Antenatal care (ANC) visits were categorized into two groups: "0–3 visits" and "4 + visits." Skilled birth attendance, counseling on breastfeeding, and postnatal checkups were each coded as binary variables with "No" and "Yes" categories.

Socioeconomic variables included the wealth index, which was divided into five quintiles: "Poorest," "Poorer," "Middle," "Richer," and "Richest." Place of residence was coded as a binary variable: "Urban" and "Rural." Region was categorized into five groups: "Eastern," "Northern,"

"Northwestern," "Southern," and "Western." All independent variables were treated as categorical in the analysis, except for the wealth index, which was ordinal but analyzed as a categorical variable to allow for easier interpretation.

Missing data were handled by excluding cases with missing values for the respective variable in the analysis. Binary variables, such as marital status and skilled birth attendance, were coded to facilitate straightforward interpretation in the regression models. This detailed coding and handling of variables ensured transparency and reproducibility of the analysis.

Data analysis

The statistical analyses were carried out in two stages using Stata version 17.0 (Stata Corporation, College Station, TX, USA). A bivariate analysis determined the distribution of EBF across the explanatory variables. The results were presented in a table indicating the proportion of EBF with their respective confidence intervals (CIs) and a p-value to show their significance level. The regression analysis included all the variables with a p-value less than or equal to 0.05. A mixed-effect multilevel binary logistic regression analysis was performed in the second stage to examine the factors associated with EBF using a four-modeled approach. The first Model is model I (Null model) had no explanatory variables, and its results demonstrated the variations in EBF attributed to the clustering at the primary sampling units (PSU). The adjusted individual level variables which assumes that a cluster level difference of EBF practice is zero were placed in Model II, whereas Model III contained the contextual level variables to evaluate contextual level factors by aggregate cluster difference of EBF practice. Model IV contained all the explanatory variables both adjusted individual and contextual factors. The mixed-effect regression analysis had fixed-effect and random effects as its results. The fixed-effect results showed the association between explanatory variables and EBF. We presented the results as an adjusted odds ratio (aOR) with their respective 95% CI. On the other hand, the random effect results imply variations in EBF. This variation was indicated by the intra-cluster correlation coefficient (ICC) values across the four models. We used the lowest value of the Akaike Information Criterion (AIC) and the highest log likelihood value to select the best-fitted model for the study. Therefore, the last model, Model IV, was adjudged as the best model from which the fixed effect results were described and discussed. Before generating the results, we weighted the dataset, and the surveyset command in Stata was used throughout the analysis. The use of the four-model approach was justified by the need to disentangle the effects of individual- and community-level factors on EBF while acknowledging the multilevel nature of the data. This approach allowed us to systematically explore the contribution of variables at different levels and to identify the most robust predictors of EBF. Additionally, the mixed-effect framework was appropriate for this study as it accounted for the non-independence of observations within clusters, which, if unaddressed, could lead to biased estimates and incorrect inferences. By progressively building the models, we were able to assess the relative importance of individual- and community-level factors and the extent to which these factors explained the observed variation in EBF.

Assumptions made in the statistical analyses

Several assumptions were made in the statistical analyses, particularly for the multilevel modeling. First, the mixed-effect multilevel binary logistic regression assumed that the data had a hierarchical structure, with individuals nested within clusters (PSUs). This assumption was critical for accounting for the non-independence of observations within clusters, which, if unaddressed, could result in biased estimates and incorrect inferences. The inclusion of random effects in the models allowed us to capture unobserved heterogeneity between clusters and to account for the clustering effect.

Second, the fixed-effect results assumed that the relationship between the explanatory variables and EBF was consistent across all clusters. This assumption was tested by progressively building the models and comparing the ICC values to assess the extent of variation explained by individual- and contextual-level factors. The ICC values indicated the proportion of total variance in EBF attributable to differences between clusters, validating the multilevel structure of the data.

Third, the models assumed that the logit link function was appropriate for modeling the binary outcome variable (EBF) and that the explanatory variables were correctly specified without significant multicollinearity. Multicollinearity was assessed during the analysis to ensure that the estimates of the explanatory variables were reliable.

Finally, the selection of the best-fitting model was based on the assumption that the AIC and log-likelihood values were appropriate criteria for model comparison. The model with the lowest AIC and highest log likelihood (Model IV) was deemed the best fit, and its results were interpreted accordingly.

By addressing these assumptions and progressively building the models, we were able to assess the relative importance of individual- and community-level factors while accounting for the multilevel nature of the data. This approach ensured robust and unbiased estimates of the factors influencing EBF.

Results

Prevalence and distribution of exclusive breastfeeding among children aged 0–5 months in Sierra Leone

Table 1 shows the bivariate analysis of the prevalence and distribution of EBF among children aged 0–5 months in Sierra Leone. The prevalence of EBF among children aged 0–5 months in Sierra Leone was 54.1% (50.2,57.9). EBF was higher among children aged 0–1 month, children born at a health facility, Children whose mothers had 4 + ANC visits, children born in rural areas and children living in the Northern region. Marital status, education level, working status, religion, listening to the radio, watching television, literacy level, counseling on breastfeeding, postnatal checkup, and wealth index were the variables not statistically associated with EBF among children aged 0–5 months in Sierra Leone at $p < 0.05$.

Fixed and random effect analyses of the factors associated with exclusive breastfeeding among children aged 0–5 months in Sierra Leone

Fixed effect results

The results indicate that children aged 2–3 months (aOR 0.30; 95% CI: 0.20, 0.45) and 4–5 months (aOR 0.08; 95% CI: 0.05, 0.13) had significantly lower odds of being exclusively breastfed compared to those aged 0–1 month. This finding highlights the decline in EBF rates as infants grow older, a trend that reflects challenges in sustaining EBF over time. This aligns with the study's goal of identifying age-related patterns in EBF practices. Contrary to global trends and expectations, the study found that children with skilled birth attendance (aOR 0.55; 95% CI: 0.32, 0.96) had lower odds of EBF compared to those without skilled birth attendance. This finding directly addresses the research objective of examining the influence of healthcare-related factors on EBF. It suggests potential gaps in postpartum care and breastfeeding counseling within health facilities, emphasizing the need for improved support for breastfeeding mothers during and after delivery. In line with the objective of exploring community-level factors, the study revealed that children in rural areas (aOR 1.62; 95% CI: 1.03, 2.55) had higher odds of EBF compared to those in urban areas. This finding underscores the influence of contextual factors on EBF practices, potentially reflecting differences in cultural norms, breastfeeding support systems, or access to alternative feeding options between rural and urban settings.

Random effect results

Table 2 indicates variations in EBF among the clusters ($\sigma 2 = 0.73$, 95% CI = 0.34 to 1.56) in model I. Approximately 18% of EBF was attributed to the clusters' variations (intraclass correlation (ICC) = 0.183). The between-cluster difference dropped to 24.3% in Model II, decreased to 17.0% in Model III, and increased to 22.2% in Model IV. These ICC results suggest that the variations in the likelihood of EBF can be attributed to the variances across the clusters. The AIC values exhibited a similar U-shaped pattern as the ICC values, reaching their lowest point in model IV. Therefore, model IV was chosen as the most suitable model for analyzing the factors that predict EBF among children aged 0–5 months in Sierra Leone.

Discussion

This study aimed to examine the prevalence and distribution of EBF among children aged 0–5 months in Sierra Leone and to identify its associated factors. The national prevalence of EBF was 54.1% (95% CI 50.2, 57.9). Several factors such as the age of the child, skilled birth attendance, and place of residence were found to be significantly associated with EBF.

According to this study, Sierra Leone's 54.1% EBF prevalence is in line with global trends, although being greater than in some sub-Saharan African nations and lower than in others. The prevalence of EBF is higher than that of the study conducted in Nigeria (16.4%) [21] and Peruvian (48.1%) [31]. On the other hand, the result mentioned above is lower than the study conducted in Malawi (71.3%) [7], Sri Lanka (76%) [32], Ethiopia (83%) [5], Nepal (66.3%) [22] and Tanzania (59%) [19]. This disparity could result from variations in the research's duration and design, the age distribution of the newborns, socioeconomic level, sociocultural elements, and the use of health services in the various study regions.

This study showed that the odds of EBF decreased significantly as the child's age increased. Compared to infants aged 0–1 month, those aged 2–3 months and 4–5 months had lower odds of exclusive breastfeeding. The outcome is similar to earlier research from Ethiopia, Zimbabwe, Bahr-Dar, India, Jigjiga, and Hawassa [6, 35–39]. A possible reason might be that women start giving their babies more food as they get older because they believe that breast milk is insufficient to satisfy their needs for nourishment and water. Another cause might have to do with mothers' perceptions that their breast milk production has declined over time, making it insufficient for the infant's growth. Additionally, it can be connected to mothers' inadequate understanding of the value of EBF and the negative effects of starting supplemental feeding before the child is six months old. In addition, working mothers returned to their jobs as their infant age increased, leaving them with insufficient time to exclusively breastfeed.

Regarding the place of delivery though not significant in our study showed that mothers who gave birth in healthcare facilities were more likely to practice EBF than mothers who gave birth at home. This result is

Table 1 Bivariate analysis of exclusive breastfeeding among children aged 0–5 months in Sierra Leone

Variables	Weighted *N* (%)	Exclusive breastfeeding % (95% CI) 54.1% (50.2, 57.9)	*p*-value
Child's age			< 0.01
0–1 months	341 (34.3)	77.4 (72.1, 82.0)	
2–3 months	350 (35.2)	54.2 (48.0, 60.3)	
4–5 months	303 (30.5)	27.7 (22.2, 34.0)	
Marital status			0.27
Never in union	140 (14.1)	59.0 (49.2, 68.1)	
Married/cohabiting	853 (85.9)	53.3 (49.1, 57.4)	
Educational attainment			0.21
No education	505 (50.8)	57.4 (52.5, 62.1)	
Primary	136 (13.7)	46.9 (38.1, 55.8)	
Secondary	330 (33.2)	52.2 (45.4, 58.9)	
Higher	23 (2.3)	51.2 (29.0, 72.9)	
Respondent employer			0.74
Family	125 (12.6)	50.6 (39.7, 61.5)	
Self-employed	600 (60.5)	55.0 (50.3, 59.7)	
Not working	268 (26.9)	53.6 (46.3, 60.7)	
Religion			0.21
Christians	174 (17.5)	58.7 (50.7, 66.3)	
Muslims	820 (82.5)	53.1 (48.7, 57.4)	
Sex of the child			0.46
Male	519 (52.2)	52.9 (47.8, 57.9)	
Female	475 (47.8)	55.4 (50.1, 60.6)	
Listen to radio			0.48
Not at all	614 (61.8)	52.9 (48.2, 57.4)	
Less than once a week	176 (17.7)	53.4 (44.5, 62.1)	
At least once a week	204 (20.5)	58.4 (50.2, 66.0)	
Watch television			0.08
Not at all	796 (80.1)	56.0 (51.8, 60.1)	
Less than once a week	111 (11.2)	48.6 (37.3, 60.2)	
At least once a week	87 (8.7)	43.6 (32.8, 54.9)	
Literacy			0.92
Cannot read at all	642 (64.6)	54.2 (49.8, 58.6)	
Able to read only parts of a sentence	205 (20.6)	54.8 (46.2, 63.1)	
Able to read the whole sentence	147 (14.8)	52.4 (43.0, 61.7)	
Place of delivery			0.04
Home	149 (15.0)	45.5 (37.0, 54.3)	
Health facility	845 (85.0)	55.6 (51.3, 59.8)	
ANC visits			0.04
0–3	190 (19.1)	46.2 (37.5, 55.2)	
4+	804 (80.9)	55.9 (51.8, 60.0)	
Skilled Birth Attendance			0.01
No	854 (86.0)	56.0 (51.7, 60.1)	
Yes	140 (14.0)	42.7 (33.9, 51.9)	
Counselled on breastfeeding			0.09
No	168 (16.9)	47.7 (39.5, 56.0)	
Yes	826 (83.1)	55.4 (51.1, 59.6)	
Postnatal checkup			0.32
No	558 (56.0)	55.8 (50.4, 61.1)	
Yes	436 (44.0)	51.9 (46.2, 57.5)	
Wealth index			0.08
Poorest	240 (24.2)	60.1 (53.4, 66.4)	
Poorer	236 (23.8)	53.6 (46.7, 60.4)	

Table 1 (continued)

Variables	Weighted *N* (%)	Exclusive breastfeeding % (95% CI) 54.1% (50.2, 57.9)	*p*-value
Middle	194 (19.5)	57.0 (48.8, 64.8)	
Richer	180 (18.1)	52.1 (43.3, 60.7)	
Richest	143 (14.4)	43.3 (32.8, 54.5)	
Place of residence			0.02
Urban	337 (34.0)	47.8 (40.9, 54.7)	
Rural	657 (66.0)	57.3 (52.7, 61.9)	
Region			< 0.01
Eastern	208 (20.9)	57.5 (48.6, 65.9)	
Northern	218 (22.0)	64.8 (55.7, 72.9)	
Northwestern	201 (20.2)	49.8 (42.1, 57.5)	
Southern	206 (20.8)	53.5 (47.4, 59.6)	
Western	160 (16.1)	41.2 (30.8, 52.4)	

consistent with studies conducted in Ethiopia Gozamin District, Azezo District, Tigray Regions, Hawassa, and Sheka Zone [39–41], Myanmar [42], Cambodia [43], and Malawi [7]. This may be explained by the fact that mothers who give birth in medical facilities have a greater chance to receive postnatal and obstetric care, as well as better access to breastfeeding resources such as connection, appropriate positioning, nutritional information, and counseling on the positive benefits of breastfeeding. Our findings support the global advice that healthcare facilities be made "baby-friendly," since parents and society enjoy the information that these facilities provide. On the contrary, a Nepalese study indicated that mothers who choose to give birth at home had a higher chance of breastfeeding their babies exclusively for six months [22].

Furthermore, our research showed that skilled birth attendance was a significant factor associated with the practice of EBF. Children of mothers with a history of skilled birth attendance had lower odds of exclusive breastfeeding compared to those without. This result contradicts the global trends and that of a previous study conducted in the United States, which found that parents who had midwives present at the time of delivery were more likely to continue breastfeeding for at least six months [44]. This could be justified by the possibility that competent birth attendance is linked to greater rates of interventions that can postpone breastfeeding, like C-sections or pain pills. For instance, breastfeeding is sometimes delayed for mothers who undergo C-sections, which may lessen the chance of EBF.

The results of this study showed a significant association between EBF practice and place of residence. Rural residence was associated with higher odds of EBF compared to urban residence. The result is similar to earlier research from Malaysia [18], India [28], Ethiopia [5], Saudi Arabia [45], and Cambodia [43]. One possible explanation could be that urban women spend quite a bit of time away from their children since they are primarily employed in temporary or permanent employment that requires them to work from home. Another possible reason could be reflecting more traditional breastfeeding practices and less access to alternatives like formula feeding in rural areas. However, the results of an Indonesian [46] study revealed that women living in urban regions were more likely to perform EBF than those living in rural areas contradicting this finding.

Policy and practice implications

The findings underscore several critical implications for enhancing exclusive breastfeeding (EBF) rates in Sierra Leone. First, there is a need for age-specific support systems to address the decline in EBF as infants grow older, which could involve comprehensive educational programs that tackle misconceptions about milk supply and infant fussiness, while equipping mothers and the community with the necessary knowledge and skills to sustain EBF. These programs should be integrated into existing vaccination initiatives to facilitate access to healthcare professionals. Second, targeted interventions should focus on urban areas where EBF rates are particularly low, including workplace lactation programs, urban breastfeeding support centers, and public education campaigns. Additionally, strengthening postnatal care services to prioritize breastfeeding counseling and training healthcare providers to deliver consistent, evidence-based support can help bridge existing gaps. Furthermore, leveraging the supportive cultural norms present in rural communities through community-based education and support programs can help maintain high EBF rates, even in urban settings. Lastly, campaigns aimed at dispelling myths about

Table 2 Factors associated with exclusive breastfeeding among children aged 0–5 months in Sierra Leone

Variables	Model I Empty model	Model II aOR (95% CI)	Model III aOR (95% CI)	Model IV aOR (95% CI)
Fixed effect results				
Child's age				
0–1 months				
2–3 months		0.31*** (0.21, 0.46)		0.30*** (0.20, 0.45)
4–5 months		0.08*** (0.05, 0.13)		0.08*** (0.05, 0.13)
ANC visits				
0–3		1.00		1.00
4+		1.45 (0.95, 2.21)		1.34 (0.87, 2.04)
Place of delivery				
Home		1.00		1.00
Health facility		1.02 (0.59, 1.77)		1.10 (0.64, 1.90)
Skilled birth attendance				
No		1.00		1.00
Yes		0.61 (0.35, 1.05)		0.55* (0.32, 0.96)
Residence				
Urban			1.00	1.00
Rural			1.26 (0.85, 1.88)	1.62* (1.03, 2.55)
Region				
Eastern			1.00	1.00
Northern			1.10 (0.68, 1.79)	1.15 (0.66, 2.00)
Northwestern			0.76 (0.46, 1.27)	0.84 (0.47, 1.52)
Southern			0.67 (0.41, 1.10)	0.61 (0.35, 1.07)
Western			0.49* (0.26, 0.93)	0.54 (0.27, 1.11)
Random effect model				
PSU variance (95% CI)	0.73 (0.34, 1.56)	1.05 (0.52, 2.15)	0.67 (0.31, 1.48)	0.94 (0.44, 1.98)
ICC	0.183	0. 243	0.170	0.222
Wald chi-square	Reference	107.89***	14.66***	115.25***
Model fitness				
Log-likelihood	-678.03288	-594.79476	-670.30372	-585.85708
AIC	1360.066	1203.59	1354.607	1195.714
N	994	994	994	994
Number of clusters	466	466	466	466

aOR = adjusted odds ratios; CI = Confidence Interval; * p<; 0.05, ** p<; 0.01, *** p<; 0.001; 1.00 = Reference category; PSU = Primary Sampling Unit; ICC = Intra-Class Correlation; AIC = Akaike's Information Criterion

breast milk insufficiency and promoting the benefits of EBF should be incorporated into antenatal and postnatal care services to enhance maternal education and awareness.

Strengths and limitations

Among the study's advantages is the utilization of a nationally representative sample, which offers a thorough picture of EBF practices throughout Sierra Leone. Nevertheless, the study has several limitations that should be acknowledged. First, the reliance on self-reported data introduces the possibility of recall bias, as participants may not accurately remember past events or behaviors. Additionally, social desirability bias may have influenced participants to provide responses they perceived as more socially acceptable, particularly concerning sensitive topics like breastfeeding practices. Second, the cross-sectional nature of the study design limits the ability to establish causal relationships between the identified factors and EBF practices. While associations can be identified, the temporal sequence required to determine causation cannot be confirmed. Lastly, some sociocultural elements that influence breastfeeding behaviors may not have been adequately captured or represented in the study, potentially limiting the comprehensiveness of the findings.

Conclusion

This study highlights that the prevalence of EBF among children aged 0–5 months in Sierra Leone remains suboptimal, with significant variations across residence and demographic groups. The age of the child, skilled birth attendance, and place of residence were factors found to be significantly associated with EBF. These observations highlight the significance of focused interventions to promote EBF, particularly focusing on sustaining breastfeeding as infants grow older, addressing disparities in urban areas, and strengthening breastfeeding support in health facilities. These strategies are essential for achieving better maternal and child health outcomes in the country.

Abbreviations

aOR	Adjusted Odds Ratio
CI	Confidence Interval
DHS	Demographic and Health Survey
EBF	Exclusive breastfeeding
MEASURE DHS	Monitoring and Evaluation to Assess and Use Results Demographic and Health Surveys
SLDHS	Sierra Leone Demographic and Health Survey
SSA	Sub-Saharan Africa
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology

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Author contributions
AT, LZ, and AO contributed to the study design and conceptualization. AT, AO and O.F.J performed the analysis. AT, AO, LZ, and O.F.J developed the initial draft. All the authors critically reviewed the manuscript for its intellectual content. All authors read and amended drafts of the paper and approved the final version. AT had the final responsibility to submit for publication.

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Data availability
The data used for this study is freely available at https://dhsprogram.com/data/dataset/Sierra-Leone_Standard-DHS_2019.cfm?flag=0.

Declarations

Ethics approval and consent to participate
The study utilized secondary data from the 2019 SLDHS, which is publicly available and anonymized to protect participants' identities. Permission to use the data was obtained from the ICF Institutional Review Board and DHD program. A detailed description of the ethical protocols followed by the DHS Program, including the anonymization process and informed consent procedures, can be accessed at [http://goo.gl/ny8T6X].

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.
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Author details
[1]Department of Nutrition and Food Hygiene, School of Public Health, Southern Medical University, Guangzhou, Guangdong 510515, P. R. China
[2]Health Promotion Program, Ministry of Health, Freetown, Western Area, Sierra Leone
[3]Institute for Development, IfD, Western Area, Freetown, Sierra Leone
[4]Research and Evaluation Unit, Health Promotion Support, Dar Es Salaam, Tanzania
[5]School of Public Health, Cheeloo College of Medicine, Shandong University, Jinan, Shandong 250012, China
[6]Department of Public Health, Ernest Bai Koroma University of Science and Technology, Makeni Campus, Makeni, Sierra Leone
[7]National Disease Surveillance Program, Ministry of Health, Freetown, Western Area, Sierra Leone
[8]Department of Community Health, College of Medicine and Allied Health Sciences, University of Sierra Leone, Freetown, Western Area, Sierra Leone
[9]Department of Nutrition and Food Hygiene, School of Public Health, Guangdong Provincial Key Laboratory of Tropical Disease Research, Key Laboratory for Safety Evaluation of Cosmetics, National Medical Products Administration (NMPA), Southern Medical University, Guangzhou, Guangdong 510515, P. R. China

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References

1. Gejo NG, Weldearegay HG, W/tinsaie KT, Mekango DE, Woldemichael ES, Buda AS, et al. Exclusive breastfeeding and associated factors among HIV positive mothers in Northern Ethiopia. PLoS ONE. 2019;14:e0210782.
2. Mekuria G, Edris M. Exclusive breastfeeding and associated factors among mothers in Debre Markos, Northwest Ethiopia: a cross-sectional study. Int Breastfeed J. 2015;10:1.
3. Jama A, Gebreyesus H, Wubayehu T, Gebregyorgis T, Teweldemedhin M, Berhe T, et al. Exclusive breastfeeding for the first six months of life and its associated factors among children age 6–24 months in Burao district, Somaliland. Int Breastfeed J. 2020;15:5.
4. Tsegaw SA, Dawed YA, Amsalu ET. Exploring the determinants of exclusive breastfeeding among infants under-six months in Ethiopia using multilevel analysis. PLoS ONE. 2021;16:e0245034.
5. Mekebo GG, Argawu AS, Likassa HT, Ayele W, Wake SK, Bedada D, et al. Factors influencing exclusive breastfeeding practice among under-six months infants in Ethiopia. BMC Pregnancy Childbirth. 2022;22:630.
6. Yismaw GA, Abuhay HW, Alemayehu MA, Derseh NM, Agimas MC, Tesfie TK. Geospatial variation of exclusive breastfeeding and its determinants among mothers of infants under 6 months in Ethiopia: Spatial and geographical weighted regression analysis. BMJ Paediatrics Open.
7. Chipojola R, Lee GT, Chiu H-Y, Chang P-C, Kuo S-Y. Determinants of breastfeeding practices among mothers in Malawi: a population-based survey. Int Health. 2019;12:132.
8. Qasem W, Fenton T, Friel J. Age of introduction of first complementary feeding for infants: a systematic review. BMC Pediatr. 2015;15:107.
9. Unar-Munguía M, Lozada-Tequeanes AL, González-Castell D, Cervantes-Armenta MA, Bonvecchio A. Breastfeeding practices in Mexico: results from the National demographic dynamic survey 2006–2018. Maternal Child Nutr. 2020;17:e13119.
10. Karim F, Khan ANS, Tasnim F, Chowdhury MAK, Billah SM, Karim T, et al. Prevalence and determinants of initiation of breastfeeding within one hour of birth: an analysis of the Bangladesh demographic and health survey, 2014. PLoS ONE. 2019;14:e0220224.
11. Nkoka O, Ntenda PAM, Kanje V, Milanzi EB, Arora A. Determinants of timely initiation of breast milk and exclusive breastfeeding in Malawi: a population-based cross-sectional study. Int Breastfeed J. 2019;14:37.
12. Sierra Leone demographic. and health survey 2013 [FR297].
13. Sierra Leone demographic. and health survey 2019 [FR365].
14. van Breevoort D, Tognon F, Beguin A, Ngegbai AS, Putoto G, van den Broek A. Determinants of breastfeeding practice in Pujehun district, Southern Sierra Leone: a mixed-method study. Int Breastfeed J. 2021;16:42.
15. Tadesse T, Mesfin F, Chane T. Prevalence and associated factors of non-exclusive breastfeeding of infants during the first six months in rural area of Sorro district, Southern Ethiopia: a cross-sectional study. Int Breastfeed J. 2016;11:25.
16. Nankumbi J, Muliira JK. Barriers to infant and child-feeding practices: A qualitative study of primary caregivers in rural Uganda. J Health Popul Nutr. 2015;33:106.
17. Kaneko A, Kaneita Y, Yokoyama E, Miyake T, Harano S, Suzuki K, et al. Factors associated with exclusive breast-feeding in Japan: for activities to support child-rearing with breast-feeding. J Epidemiol. 2006;16:57.
18. Tan KL. Factors associated with exclusive breastfeeding among infants under six months of age in Peninsular Malaysia. Int Breastfeed J. 2011;6:2.
19. Jahanpour OF, Okango EL, Todd J, Mwambi H, Mahande MJ. Mapping regional variability of exclusive breastfeeding and its determinants at different infant's age in Tanzania. BMC Pregnancy Childbirth. 2023;23:769.
20. Alzaheb RA. Factors influencing exclusive breastfeeding in Tabuk, Saudi Arabia. Clin Med Insights Pediatr. 2017;11:11.
21. Agho KE, Dibley MJ, Odiase JI, Ogbonmwan SM. Determinants of exclusive breastfeeding in Nigeria. BMC Pregnancy Childbirth. 2011;11:2.
22. Khanal V, Sauer K, Zhao Y. Exclusive breastfeeding practices in relation to social and health determinants: a comparison of the 2006 and 2011 Nepal demographic and health surveys. BMC Public Health. 2013;13:958.
23. Yimer DS, Adem OS, Arefayene M, Chanie T, Endalifer ML. Exclusive breastfeeding practice and its associated factors among children aged 6–23 months in Woldia town, Northwest Ethiopia. Afr Health Sci. 2021;21:1877.

24. Chandhiok N, Singh KJ, Sahu D, Singh L, Pandey A. Changes in exclusive breastfeeding practices and its determinants in India, 1992–2006: analysis of National survey data. Int Breastfeed J. 2015;10:34.
25. Beyene AM, Liben ML, Arora A. Factors associated with the early termination of exclusive breastfeeding among mother-infant dyads in Samara-Logia, Northeastern Ethiopia. BMC Pediatr. 2019;19:428.
26. Li J, Zhao C, Wang Y, Wang YP, Chen CY, Huang Y, et al. Factors associated with exclusive breastfeeding practice among mothers in nine community health centres in Nanning City, China: a cross-sectional study. Int Breastfeed J. 2021;16:71.
27. Khanal V, da Cruz JLNB, Karkee R, Lee AH. Factors associated with exclusive breastfeeding in Timor-Leste: findings from demographic and health survey 2009–2010. Nutrients. 2014;6:1691.
28. Ratinthorn A, Sindhu S, Spatz DL, Viwatwongkasem C. Factors influencing exclusive breastfeeding among urban employed mothers: A case-control St. Pac Rim Int J Nurs Res. 2020;24:54.
29. Afzal Aghaee M, Mosa Farkhani E, Bahrami Taghanaki H, Mohajeri N, Tavakoli F, Barid Kazemi S. The factors affecting exclusive breastfeeding in 6 month-old infants: A population-based case-control study. J Compr Pediatr. 2019;11.
30. Sierra Leone. - total population by gender 2022. Statista.
31. Yamunaque-Carranza M, Medina-Ramirez SA, Mamani-García CS, Caira-Chuquineyra B, Fernandez-Guzman D, Urrunaga-Pastor D, et al. Factors associated with adequate breastfeeding: evidence from the Peruvian demographic and health survey, 2019. Int J Environ Res Public Health. 2022;19:13607.
32. Senarath U, Siriwardena I, Godakandage SSP, Jayawickrama H, Fernando DN, Dibley MJ. Determinants of breastfeeding practices: an analysis of the Sri Lanka demographic and health survey 2006–2007. Maternal Child Nutr. 2011;8:315.
33. Munjoma Takudzwa Pamela. Socio-demographic factors associated with exclusive breastfeeding among mothers with children less than six months of age in Zimbabwe.
34. Belachew AB, Kahsay AB, Abebe YG. Individual and community-level factors associated with introduction of prelacteal feeding in Ethiopia. Archives Public Health. 2016;74:6.
35. Ogbo FA, Dhami MV, Awosemo AO, Olusanya BO, Olusanya J, Osuagwu UL, et al. Regional prevalence and determinants of exclusive breastfeeding in India. Int Breastfeed J. 2019;14:20.
36. Obsiye M. Determinants of exclusive breast-feeding practices among mothers of infants aged under six months in Jigjiga town, Eastern Ethiopia: A cross-sectional study. Int J Sciences: Basic Appl Res (IJSBAR). 2019;46:62.
37. Adugna B, Tadele H, Reta F, Berhan Y. Determinants of exclusive breastfeeding in infants less than six months of age in Hawassa, an urban setting, Ethiopia. Int Breastfeed J. 2017;12:45.
38. Hunegnaw MT, Gezie LD, Teferra AS. Exclusive breastfeeding and associated factors among mothers in Gozamin district, Northwest Ethiopia: a community based cross-sectional study. Int Breastfeed J. 2017;12:30.
39. Asemahagn MA. Determinants of exclusive breastfeeding practices among mothers in Azezo district, Northwest Ethiopia. International Breastfeeding Journal.
40. Hagos D, Tadesse AW. Prevalence and factors associated with exclusive breastfeeding among rural mothers of infants less than six months of age in Southern nations, nationalities, peoples (SNNP) and Tigray regions, Ethiopia: a cross-sectional study. Int Breastfeed J. 2020;15:25.
41. Awoke S, Mulatu B. Determinants of exclusive breastfeeding practice among mothers in Sheka zone, Southwest Ethiopia: A cross-sectional study. Public Health Pract. 2021;2:100108.
42. Kyi W, Mongkolchati A, Chompikul J, Wongsawass S. Prevalence and associated factors of exclusive breastfeeding among mothers in Pan-Ta-Naw Township, Myanmar. J Public Health Dev. 2015;13.
43. Um S, Chan YZC, Tol B, Sopheab H. Determinants of exclusive breastfeeding of infants under six months among Cambodian mothers. J Pregnancy. 2020;2020:1.
44. Wallenborn JT, Masho SW. Association between breastfeeding duration and type of birth attendant. J Pregnancy. 2018;2018:13.
45. El-Gilany A-H, Shady E, Helal R. Exclusive breastfeeding in Al-Hassa, Saudi Arabia. Breastfeed Med. 2011;6:209.
46. Agung Dwi Laksono. The effects of mother's education on achieving exclusive breastfeeding in Indonesia -. PMC Public Health. 2021;21:14.

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