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ORIGINAL ARTICLE

Prevalence of and factors associated with early initiation of breastfeeding in Bangladesh: a multilevel modelling

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Background: Early initiation breastfeeding (EIBF) is a sign of good health for both the mother and the newborn baby. The objective of this study was to estimate the prevalence of EIBF among mothers in Bangladesh and to identify its associated factors.

Methods: The study used the most recent Bangladesh Demographic and Health Survey 2017–2018 data. A total of 4776 (weighted) respondents were included in the final analysis. The association between the outcome and the independent variables was determined using multilevel (mixed effects) logistic regression analysis.

Results: The overall weighted prevalence of EIBF among Bangladeshi mothers was 61.19% (confidence interval [CI] 59.80 to 62.56). The study shows that non-poor wealth status (adjusted odds ratio [AOR] 0.81 [95% CI 0.68 to 0.95]), institutional delivery (AOR 0.77 [95% CI 0.61 to 0.96]) and caesarean delivery (AOR 0.31 [95% CI 0.26 to 0.38]) were associated with the lower odds of EIBF. Mother's secondary education (AOR 1.34 [95% CI 1.01 to 1.83]), at least four antenatal care visits (AOR 1.36 [95% CI 1.04 to 1.53]), normal birthweight (AOR 1.42 [95% CI 1.09 to 1.85]) and placed on mother's chest and bare skin after birth (AOR 1.33 [95% CI 1.11 to 1.60]) were associated with higher odds of EIBF.

Conclusion: In order to enhance EIBF in Bangladesh, health professionals should emphasise skin-to-skin contact after delivery.

Keywords: Bangladesh, BDHS, breastfeeding, determinants, initiation of breastfeeding.

Introduction

Early initiation of breastfeeding (EIBF) is defined as feeding the infant within 1 h of birth.[1,2] EIBF is important for both maternal and newborn baby health, ensuring that the newborn receives vital nutrition, including colostrum.[3] The mother's breast milk that is produced a few days after delivery is highly nutritional and contains minerals, vitamins and amino acids.[4] EIBF has been shown to minimise neonatal morbidity and death, as well as newborn weight loss.[5,6] As a result, the newborn baby's life could be saved and several ailments, including respiratory and diarrheal diseases, are prevented.[1,6,7] Furthermore, timely breastfeeding is linked to a lower risk of maternal death by avoiding post-partum haemorrhage.[8] Globally, the prevalence of EIBF is about 42%.[6] While the prevalence in European countries is 43%,[9] it ranges from 34.7% to 87.2% among African countries,[10–15] 38.7% to 42% in Asia[12,13,16,17] and is 51.4% in Bangladesh.[18,19]

Several studies have documented that sociodemographic and economic factors are associated with the timely initiation of breastfeeding. A study conducted in Ethiopia revealed that rural mothers were less likely to initiate early breastfeeding than urban mothers.[10] In contrast, a Bangladeshi study found that rural

mothers were likely to initiate early breastfeeding than urban mothers.[18] Studies have also reported that the mother's age, education level and wealth status were significantly associated with EIBF.[20] Another Bangladeshi study found that mothers who give birth via caesarean section initiate early breastfeeding at a rate 69.8% lower than mothers who had a normal childbirth.[18] A previous study also reported that mothers who give birth at health institutions were 3.4 times more likely to initiate early breastfeeding than those who had a home delivery.[21] Previous evidence suggests that clinical factors such as antenatal care (ANC),[17,22,23] place of delivery,[7,17] normal delivery,[7,24] birth order,[23] average birthweight[7] and intended pregnancy[23] are significantly associated with EIBF. Despite the usefulness of EIBF, its prevalence in Bangladesh has remained low over time when compared with adjacent countries.[18] The prevalence is highly influenced by community factors such as clusters, administrative divisions and place of residence.[22,23]

A few studies in Bangladesh have investigated the prevalence of EIBF and its associated factors.[24,26] This study assesses the factors associated with EIBF using data from the 2017–2018 Bangladesh Demographic and Health Survey (BDHS). The objective of this study was to estimate the prevalence of EIBF and to determine its associated factors among mothers ages 15–49 y in Bangladesh using a multilevel logistic regression model.

Methods

Data source

The BDHS 2017–2018 data set was analysed in this study. The survey was carried out from October 2017 to March 2018 under the National Institute of Population Research and Training, Medical Education and Family Welfare Division and Ministry of Health and Family Welfare of Bangladesh.[27]

Study design

A two-stage stratified sampling design was used in the BDHS 2017–2018 to select the households from a list of enumeration areas (EAs) in the 2011 Bangladesh census.[27] A total of 675 EAs or clusters were selected in this survey, which was considered as the primary sampling unit (PSU). Then a total of 20 250 households were randomly selected from the PSU using the stratified sampling method. The detailed procedure of sampling and study design can be found in the report of this survey, which is publicly available.[27] To collect the information on EIBF, married women who were of reproductive age (15–49 y) were interviewed. The information on EIBF was available for the last child born in the 2 y preceding the survey. We included a total of 4776 (weighted) women with their last child as the final sample of this study from a total of 10 460 women in the BDHS 2017–2018 (Figure 1).[27]

Outcome measure

The primary outcome variable was EIBF, which was dichotomized as 'yes' or 'no' according to the World Health Organization (WHO) definition.[28] According to the WHO, when a child is breastfed within 1 h of birth, then it is early initiation, otherwise it is considered late initiation.[28] In the BDHS 2017–2018 survey, EIBF was assessed by asking how long after birth did you first put (child name) to the breast? The initiation of breastfeeding was dichotomized as 1 for a child who was put to the breast within 1 h of birth (early initiation) and 0 otherwise.[27]

Explanatory variables

The explanatory variables were selected based on previous studies that explored the prevalence and associated factors of EIBF among Bangladeshi mothers using BDHS data.[18,23,26,29] The following covariates were considered in the present study: place of residence (urban, rural), family size (≤5 members, >5 members),[23] religion (Muslim, non-Muslim), mother's education level (no education, primary, secondary, higher), mother's age (<20 y, 20–29 y, ≥30 y), husband's education level (no education, primary, secondary, higher), current working status of mother (not working, currently working), number of ever-born children (1–2, 3–5, >5), mother's age at first birth (≤20 y, >20 y),[23] wanted last child (wanted then, wanted later, wanted no more), number of ANC visits (none, 1–3, ≥4), place of delivery (home, hospital/clinic), mode of delivery (vaginal, caesarean), sex of last child (male, female), birth order of child (1, 2–3, ≥4), the child was put on the mother's chest and bare skin after birth (no, yes). Household wealth status was classified into two categories: poor and non-poor.[30] The child's birthweight was categorised as low, normal, not weighted/don't know. The birthweight was considered low when it was <2500 g and normal when it was ≥2500 g.[31] The body mass index (BMI) of the mothers was classified as underweight (<18.5 kg/m2), normal (18.5–24.9 kg/m2), overweight (25.0–29.9 kg/m2) and obese (≥30.0 kg/m2).[32]

Data analysis

The BDHS data were prepared using the survey weights before the analysis. Then both the unweighted and weighted prevalence of EIBF across different characteristics of study participants were estimated. We used the 'svy' command to assign the sample weight to adjust for the clustering effect and sample stratification. Since the BDHS 2017–2018 used a two-stage stratified cluster sampling having a hierarchical composition, a single-level analysis model was not suitable for analysing such a data set, because the usual logistics regression model cannot control these cluster effects.[25] To control the variability between cluster effects, a highly structured model like the multilevel logistic regression approach is better in multilevel data that used stratified sampling. The multilevel logistic regression model is an advanced statistical model that is used to maintain within- and between-cluster effect variations. The multilevel model accounts for the effects associated with each level of the hierarchy.[25] In data that has a hierarchical structure, individuals are not treated as independent and are considered nested in a larger unit. In contrast, multilevel analysis provides an appropriate approach to examining the effects of individual-level and group-level variables simultaneously. It can also estimate both between-group and within-group variations and help to determine how the levels interact with each other. Thus multilevel models were used in order to draw insights regarding the causes of both the interindividual and the intergroup variations in clusters.

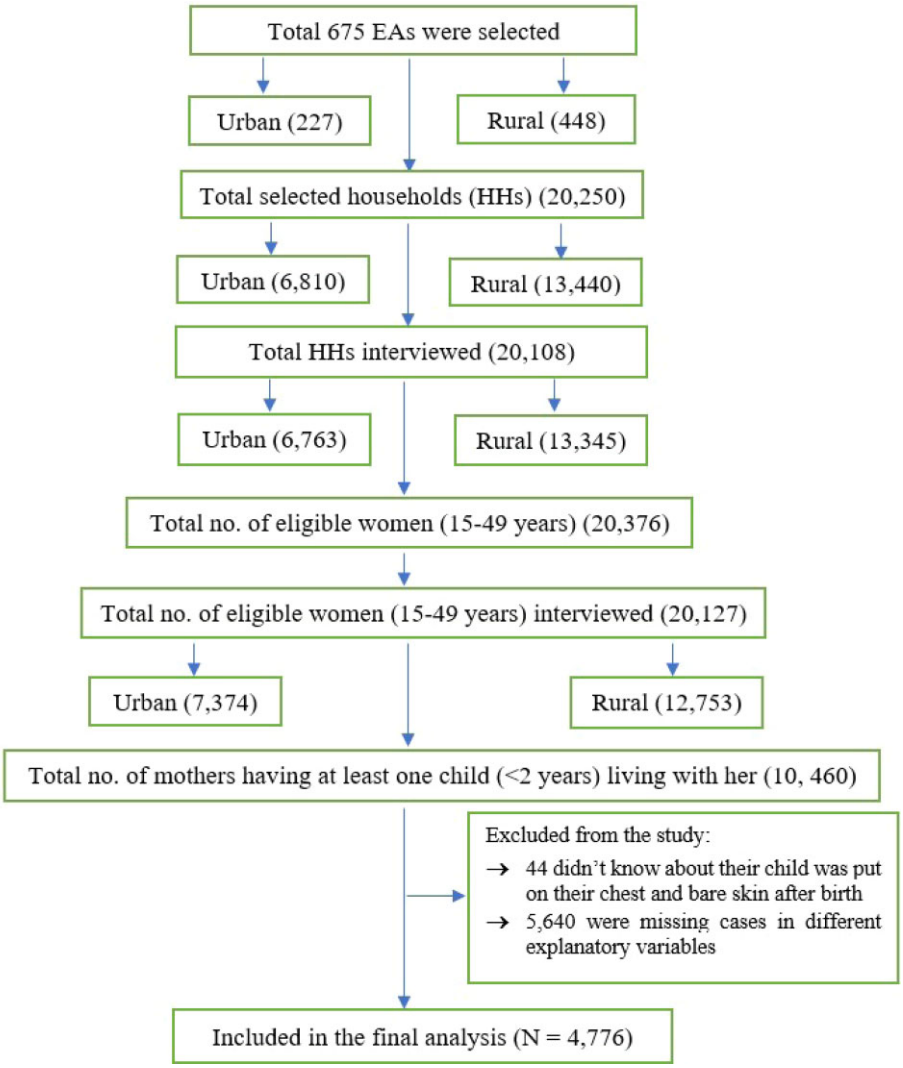

Figure 1. Flow chart of the participant's selection from BDHS 2017–2018 data.

To reduce the cluster effect that exists in the dataset, multilevel logistic regression (MLLR) analysis was used to identify the association between outcome and independent variables. We constructed four different models using MLLR where model 0 was the null model (which had no explanatory variables) and models 1 and 2 were two-level logistic regression models. In models 1 and 2, place of residence and clusters (EAs) were considered as level 2 factors, respectively. In model 3, a 3-level logistic regression model was employed in which the place of residence was considered as level 2 and clusters as level 3 factors. After the application of multilevel models, the intraclass correlation coefficient (ICC) was also estimated to check the cluster effects on the outcome variable. For measures of variation, the median odds ratio (MOR) was also calculated. The MOR is the unexplained cluster heterogeneity. Finally, the model fitness was tested using Akaike's information criterion (AIC). The adjusted odds ratio (AOR) along with 95% confidence interval (CI) were interpreted and p-values <0.05 were considered statistically significant. Multicollinearity among covariates was checked using the variance inflation factor. All statistical analyses were performed using Stata BE version 17.0 (StataCorp, College Station, TX, USA).

Results

Participants' characteristics

The majority of the respondents were from Dhaka division (25.14%), followed by Chittagong division (20.89%). Almost three-fourths of mothers (73.82%) were from rural areas and 4 of 10 respondents (41.49%) had a wealth status of poor. The majority of the respondents (61.27%) were 20–29 y of age and almost half of the mothers (49.20%) were educated up to the secondary level. Twenty-two percent of mothers were categorised as either overweight or obese, while 8% of did not seek any ANC visits for their last pregnancy. Half of the respondents (50.47%) had their deliveries at home (without facilities) and 67.38% had a normal childbirth. Most of the mothers (80.01%)

had their first child before they were 20 y of age. An overwhelmingly large number of the babies (83.88%) were not put on the mother's chest and bare skin after birth. A total of 38.29% of children had normal birthweight, but more than half of the babies (54.81%) were not weighed immediately after birth (Table 1).

Prevalence of EIBF

The overall prevalence (weighted) of EIBF among Bangladeshi mothers was 61.19% (95% CI 59.80 to 62.56). Among all the administrative divisions of Bangladesh, the highest prevalence was found in Rangpur (66.57%), followed by Sylhet division (66.13%), while the lowest prevalence was noted in Khulna division (51.71%). We found that working mothers were more prone to breastfeed their babies within 1 h of birth than non-working mothers (64.13% versus 59.44%, p=0.010). In terms of place of delivery, about 69% (95% CI 67.75 to 71.42) of mothers who delivered at home initiated breastfeeding within the first hour after delivery compared with 52.59% of mothers who delivered in health facilities. Also, mothers who underwent normal delivery had a higher prevalence of EIBF compared with those who underwent caesarean delivery (69.24% versus 44.55%, p<0.001). A total of 65.32% (95% CI 61.88 to 68.60) of the babies who were put on the mother's chest and bare skin after birth received EIBF, compared with 60.39% for those who were not (Table 2).

Multilevel logistic regression analysis

Results obtained from three regression (mixed effects) models are displayed in Table 3. Random effects results and estimation of model fitness of four regression models are also presented in Table 3. The estimations (division: 0.193; cluster: 0.535) of the null model (model 0) suggest the presence of clustering variation in the outcome variable among administrative divisions and enumerations (clusters). In model 3, ICC values for level 2 and level 3 random intercepts were >0, thus it can be said that EIBF among Bangladeshi mothers varies among clusters (enumerations) and clusters within a division. Again, the AIC value for model 3 was less than that of other models. Hence, considering both ICC and AIC, we selected model 3 as our final model.

The study shows that wealth status, mother's education, ANC visit, place of delivery, mode of delivery, child birthweight and put on mother's chest and bare skin after birth were significant determinants of EIBF. Mothers from non-poor households were less likely (AOR 0.81 [95% CI 0.68 to 0.95]) to breastfeed their babies within 1 h of birth compared with mothers from poor families. Mothers who utilized health facilities during their deliveries were less likely to initiate breastfeeding within 1 h of birth than mothers having home deliveries (AOR 0.77 [95% CI 0.61 to 0.96]). Mothers who underwent caesarean birth were less likely to provide initial breastfeeding within 1 h than mothers who did normal childbirth (AOR 0.31 [95% CI 0.26 to 0.38]).

The likelihood of EIBF among mothers who were educated up to the secondary level was 34% higher compared with mothers having no formal education (AOR 1.34 [95% CI 1.01 to 1.83]). The study found higher odds of EIBF among mothers who sought at least four ANC visits compared with those with no ANC visit (AOR 1.36 [95% CI 1.04 to 1.53]). The likelihood of providing EIBF was 42% higher among mothers with normal birthweight babies than those with low birthweight babies (AOR 1.42 [95% CI 1.09 to 1.85]). We identified a crucial factor that babies who were placed on the mother's chest and exposed skin after birth had a 33% higher chance of having EIBF than those who were not (AOR 1.33 [95% CI 1.11 to 1.60]) (Table 3).

Discussion

In terms of health and nutrition, timely breastfeeding is critical for both mothers and babies. As a result, we set out to estimate the prevalence of EBIF in Bangladesh using the most recent round of BDHS data. The findings of this study revealed that the prevalence of EIBF in Bangladesh is 61.19% (95% CI 59.80 to 62.56), which is at least 10% higher compared with the previous BDHS 2014 report.[18] A plausible explanation could be increased health-related literacy and maternal awareness regarding EIBF and its importance for newborns. Also, this may be related to increased awareness of the importance of EIBF by the government and other organisations. For example, in Bangladesh, the government ran advertisements regarding EIBF through mass media to raise awareness among mothers and the community-based health platform of a large non-governmental organization provided counselling and community mobilization through its network of field officers, community-based frontline workers and volunteers.[33] These initiatives may have contributed to increase EIBF in Bangladesh. The results of this study also indicate that wealth status, mother's education level, number of ANC visits, place of delivery, mode of delivery, child birthweight and whether the child was put on the mother's chest and bare skin after birth are statistically significant factors in EIBF.

Our findings indicate that mothers from affluent families are less likely to be motivated to initiate breastfeeding within 1 h of birth than mothers from poor families, which contrasts with previous research conducted in Bangladesh.[18] This finding also stands in contrast to the findings of earlier studies elsewhere.[11,23,34] It may be that Bangladeshi mothers are aware of good breastfeeding habits regardless of their socio-economic status through interpersonal communication or through the mass media.[35] In order to understand this discrepancy, a further cohort study is warranted. Additionally, mothers with secondary education were more likely to breastfeed their infants early than mothers with no formal education, which corroborated several prior studies.[18,23,36] This could be because maternal education has a significant impact on learning about the importance of EIBF initiation. Also, educated mothers have better knowledge about health, making them more aware of their children's health.[23] In addition, educated mothers are better able to absorb and comprehend health promotion information as well as handle skilled or professional birth help or decide to deliver in a health facility.[37]

As with earlier research, this research reveals that mothers who had at least four ANC visits throughout their recent pregnancy were more likely to have EIBF than mothers who had none.[21,38] Perhaps mothers who attend ANC are advised by professionals on the importance of EIBF and mothers who have more ANC visits are more likely to give birth in an institution with skilled birth attendants.[39] However, EIBF was not shown to be significantly associated with ANC visits.[40] This difference could relate

Table 1. Characteristics of study participants across different subcategories

Characteristics	Categories	Unweighted frequency	Unweighted percentage	Weighted frequency	Weighted percentage
Administrative division	Barisal	512	10.77	276	5.78
	Chittagong	775	16.31	998	20.89
	Dhaka	685	14.41	1201	25.14
	Khulna	493	10.37	437	9.15
	Mymensingh	584	12.29	418	8.75
	Rajshahi	501	10.54	560	11.73
	Rangpur	544	11.45	520	10.89
	Sylhet	659	13.86	367	7.67
Place of residence	Urban	1609	33.85	1251	26.18
	Rural	3144	66.15	3526	73.82
Family size	≤5	2402	50.54	2438	51.05
	>5	2351	49.46	2338	48.95
Wealth status	Poor	2007	42.23	1982	41.49
	Non-poor	2746	57.77	2795	58.51
Religion	Muslim	4354	91.61	4389	91.89
	Non-Muslim	399	8.39	387	8.11
Mothers' education level	No education	295	6.21	299	6.26
	Primary	1321	27.79	1315	27.53
	Secondary	2279	47.95	2350	49.20
	Higher	858	18.05	812	17.01
Mother's age (years)	<20	821	17.27	855	17.89
	20–29	2928	61.60	2926	61.27
	≥30	1004	21.12	995	20.83
Husband's education level	No education	662	13.93	660	13.81
	Primary	1601	33.68	1617	33.86
	Secondary	1578	33.20	1628	34.09
	Higher	912	19.19	871	18.24
Mother's working status	No	2968	62.44	2995	62.72
	Yes	1785	37.56	1781	37.28
Ever-born children, *n*	1–2	3361	70.71	3386	70.90
	3–5	1294	27.22	1299	27.71
	>5	98	2.06	90	1.89
Age at first birth (years)	≤20	3735	78.58	3821	80.01
	>20	1018	21.42	955	19.99
Wanted the last child	Wanted then	3738	78.65	3759	78.70
	Wanted later	625	13.15	630	13.20
	Wanted no more	390	8.21	387	8.10
Mother's BMI categories	Underweight	765	16.10	737	15.43
	Normal	2928	61.60	2974	62.28
	Overweight	850	17.88	851	17.81
	Obese	210	4.42	214	4.48
ANC visits, *n*	None	390	8.21	386	8.09
	1–3	2075	43.66	2139	44.78
	≥4	2288	48.14	2251	47.13
Place of delivery	Home	2380	50.07	2411	50.47
	Hospital/clinic	2373	49.93	2365	49.53
Mode of delivery	Vaginal	3195	67.22	3218	67.38
	Caesarean	1558	32.78	1558	32.62
Child birthweight	Low	319	6.71	329	6.90
	Normal	1827	38.44	1829	38.29
	Not weighed/don't know	2607	54.85	2618	54.81
Sex of child	Male	2493	52.45	2495	52.24
	Female	2260	47.55	2281	47.76
Birth order	1	1795	37.77	1801	37.71
	2–3	2386	50.20	2394	50.12
	≥4	572	12.03	581	12.17
Child was put on the mother's chest and bare skin after birth	No	3979	83.72	4006	83.88
	Yes	774	16.28	770	16.12

Table 2. Prevalence of EIBF in Bangladesh

Characteristics	Categories	Unweighted prevalence (95% CI)	Weighted prevalence (95% CI)	p-Value
Overall		61.14 (59.75 to 62.52)	61.19 (59.80 to 62.56)	
Administrative division	Barisal	62.89 (58.62 to 66.97)	63.71 (63.70 to 63.72)	<0.001
	Chittagong	55.10 (51.57 to 58.57)	55.69 (55.58 to 55.71)	
	Dhaka	63.94 (60.27 to 67.45)	64.20 (64.18 to 64.22)	
	Khulna	51.32 (46.91 to 55.71)	51.71 (51.68 to 51.72)	
	Mymensingh	63.53 (59.54 to 67.34)	63.21 (63.20 to 63.22)	
	Rajshahi	60.48 (56.13 to 64.67)	60.94 (60.92 to 60.95)	
	Rangpur	64.89 (60.78 to 68.79)	66.57 (66.56 to 66.58)	
	Sylhet	66.62 (62.92 to 70.12)	66.13 (66.11 to 66.15)	
Place of residence	Urban	59.66 (57.25 to 62.04)	59.79 (57.04 to 62.47)	0.135
	Rural	61.90 (60.18 to 63.58)	61.68 (60.07 to 63.28)	
Family size, *n*	≤5	61.20 (59.23 to 63.13)	61.76 (59.81 to 63.67)	0.933
	>5	61.08 (59.09 to 63.03)	60.59 (58.59 to 62.55)	
Wealth status	Poor	67.31 (65.23 to 69.33)	67.40 (65.30 to 69.43)	<0.001
	Non-poor	56.63 (54.77 to 58.47)	56.78 (54.94 to 58.61)	
Religion	Muslim	61.21 (59.75 to 62.65)	61.18 (59.73 to 62.61)	0.752
	Non-Muslim	60.40 (55.52 to 65.09)	61.29 (56.34 to 66.02)	
Mother's education level	No education	64.41 (58.77 to 69.67)	62.67 (57.04 to 67.97)	<0.001
	Primary	65.40 (62.80 to 67.92)	65.58 (62.97 to 68.10)	
	Secondary	61.30 (59.28 to 63.28)	61.07 (59.08 to 63.03)	
	Higher	53.03 (49.68 to 56.35)	53.86 (50.42 to 57.27)	
Mother's age (years)	<20	59.20 (55.80 to 62.51)	58.69 (55.36 to 61.95)	0.181
	20–29	60.93 (59.15 to 62.68)	60.87 (59.09 to 62.63)	
	≥30	63.35 (60.32 to 66.27)	64.25 (61.22 to 67.17)	
Husband's education level	No education	67.07 (63.39 to 70.55)	65.94 (62.23 to 69.46)	<0.001
	Primary	65.21 (62.84 to 67.51)	65.59 (63.24 to 67.87)	
	Secondary	57.98 (55.53 to 60.40)	57.43 (55.01 to 59.81)	
	Higher	55.15 (51.91 to 58.36)	56.44 (53.12 to 59.70)	
Mother's working status	No	59.74 (57.96 to 61.49)	59.44 (57.67 to 61.18)	0.010
	Yes	63.47 (61.21 to 65.68)	64.13 (61.87 to 66.33)	
Ever born children, *n*	1–2	58.85 (57.18 to 60.50)	59.26 (57.59 to 60.90)	<0.001
	3–5	66.00 (63.37 to 68.53)	65.13 (62.50 to 67.68)	
	>5	75.51 (66.05 to 83.01)	76.60 (66.79 to 84.20)	
Age at first birth (years)	≤20	62.57 (61.01 to 64.11)	62.62 (61.07 to 64.14)	<0.001
	>20	55.89 (52.82 to 58.92)	55.45 (52.28 to 58.58)	
Wanted last child	Wanted then	60.86 (59.29 to 62.41)	61.12 (59.56 to 62.67)	0.037
	Wanted later	59.20 (55.30 to 62.99)	58.35 (54.45 to 62.14)	
	Wanted no more	66.92 (62.10 to 71.42)	66.41 (61.55 to 70.95)	
Mother's BMI	Underweight	63.40 (59.92 to 66.74)	62.34 (58.78 to 65.77)	0.019
	Normal	62.02 (60.25 to 63.76)	61.77 (60.01 to 63.50)	
	Overweight	57.06 (53.70 to 60.35)	58.96 (55.61 to 62.22)	
	Obese	57.14 (50.36 to 63.67)	57.91 (51.19 to 64.35)	
ANC visits, *n*	None	67.95 (63.15 to 72.39)	67.50 (62.66 to 71.99)	<0.001
	1–3	63.18 (61.08 to 65.23)	61.95 (59.87 to 63.98)	
	≥4	58.13 (56.09 to 60.14)	59.38 (57.34 to 61.39)	
Place of delivery	Home	70.67 (68.81 to 72.47)	69.62 (67.75 to 71.42)	<0.001
	Hospital/clinic	51.58 (49.57 to 53.59)	52.59 (50.58 to 54.60)	
Mode of delivery	Normal	70.05 (68.43 to 71.61)	69.24 (67.62 to 70.81)	<0.001
	Caesarean	42.88 (40.44 to 45.35)	44.55 (42.10 to 47.03)	
Child birthweight	Low	47.65 (42.22 to 53.14)	48.71 (43.34 to 54.10)	<0.001
	Normal	54.79 (52.50 to 57.06)	55.87 (53.58 to 58.13)	
	Not weighed/don't know	67.24 (65.42 to 69.02)	66.47 (64.64 to 68.26)	
Sex of child	Male	60.97 (59.04 to 62.87)	61.29 (59.36 to 63.18)	0.801
	Female	61.33 (59.30 to 63.32)	61.07 (59.05 to 63.05)	
Birth order	1	56.94 (54.63 to 59.21)	57.15 (54.85 to 59.42)	<0.001
	2–3	62.45 (60.48 to 64.37)	62.50 (60.54 to 64.42)	
	≥4	68.88 (64.97 to 72.54)	68.30 (64.40 to 71.96)	
Child was put on the mother's chest and bare skin after birth	No	60.14 (58.61 to 61.65)	60.39 (58.87 to 61.90)	0.001
	Yes	66.28 (62.87 to 69.53)	65.32 (61.88 to 68.60)	

p-Values were obtained by Pearson's χ^2 test.

Table 3. Factors associated with the EIBF in Bangladesh

Characteristics	Categories	Model 0	Model I AOR (95% CI)	Model II AOR (95% CI)	Model III AOR (95% CI)
Measure of association					
Place of residence	Urban		1	1	1
	Rural		0.88 (0.77 to 1.02)	0.88 (0.74 to 1.04)	0.90 (0.76 to 1.07)
Family size, *n*	≤5		1	1	1
	>5		1.00 (0.88 to 1.14)	0.99 (0.87 to 1.13)	0.99 (0.87 to 1.14)
Wealth status	Poor		1	1	1
	Non-poor		0.79** (0.68 to 0.92)	0.80** (0.68 to 0.95)	0.81* (0.68 to 0.95)
Religion	Muslim		1	1	1
	Non-Muslim		1.05 (0.84 to 1.32)	1.07 (0.83 to 1.37)	1.06 (0.83 (1.37)
Mother's education level	No education		1	1	1
	Primary		1.15 (0.87 to 1.54)	1.15 (0.85 to 1.55)	1.16 (0.86 to 1.56)
	Secondary		1.42* (1.05 to 1.87)	1.31* (1.02 to 1.78)	1.34* (1.01 to 1.83)
	Higher		1.24 (0.88 to 1.76)	1.23 (0.84 to 1.75)	1.26 (0.87 to 1.81)
Mother's age (years)	<20		1	1	1
	20–29		1.09 (0.89 to 1.33)	1.09 (0.89 to 1.35)	1.08 (0.88 to 1.33)
	≥30		1.14 (0.85 to 1.52)	1.13 (0.83 to 1.53)	1.12 (0.83 (1.52)
Husband's education level	No education		1	1	1
	Primary		0.99 (0.81 to 1.23)	0.99 (0.80 to 1.24)	0.99 (0.80 to 1.24)
	Secondary		0.89 (0.71 to 1.11)	0.88 (0.70 to 1.11)	0.89 (0.71 to 1.13)
	Higher		1.03 (0.79 to 1.36)	1.02 (0.76 to 1.36)	1.02 (0.76 to 1.36)
Mother's working status	No		1	1	1
	Yes		0.97 (0.84 to 1.10)	0.93 (0.81 to 1.08)	0.94 (0.82 to 1.09)
Ever born children, *n*	1–2		1	1	1
	3–5		1.11 (0.91 to 1.36)	1.12 (0.91 to 1.39)	1.13 (0.92 to 1.39)
	>5		1.51 (0.85 to 2.66)	1.54 (0.85 to 2.79)	1.54 (0.85 to 2.79)
Age at first birth (years)	≤20		1	1	1
	>20		0.95 (0.80 to 1.13)	0.98 (0.81 to 1.17)	0.96 (0.80 to 1.15)
Wanted the last child	Wanted then		1	1	1
	Wanted later		0.87 (0.73 to 1.05)	0.86 (0.71 to 1.05)	0.86 (0.71 to 1.05)
	Wanted no more		0.93 (0.72 to 1.21)	0.99 (0.76 to 1.32)	0.99 (0.75 to 1.30)
Mother's BMI	Underweight		1	1	1
	Normal		1.04 (0.88 to 1.24)	1.01 (0.84 to 1.21)	1.02 (0.85 to 1.23)
	Overweight		1.05 (0.84 to 1.31)	1.01 (0.80 to 1.28)	1.04 (0.82 to 1.31)
	Obese		1.20 (0.85 to 1.68)	1.11 (0.77 to 1.59)	1.14 (0.79 to 1.63)
ANC visits, *n*	None		1	1	1
	1–3		1.09 (0.85 to 1.39)	1.09 (0.84 to 1.41)	1.10 (0.85 to 1.42)
	≥4		1.34* (1.04 to 1.49)	1.31* (1.01 to 1.52)	1.36* (1.04 to 1.53)

Table 3. Continued

Characteristics	Categories	Model 0	Model I AOR (95% CI)	Model II AOR (95% CI)	Model III AOR (95% CI)
Place of delivery	Home		1	1	1
	Hospital/clinic		0.79* (0.63 to 0.98)	0.77* (0.61 to 0.96)	0.77* (0.61 to 0.96)
Mode of delivery	Normal		1	1	1
	Caesarean		0.33*** (0.28 to 0.40)	0.32*** (0.26 to 0.39)	0.31***(0.26 to 0.38)
Child birthweight	Low		1	1	1
	Normal		1.40** (1.09 to 1.80)	1.44** (1.10 to 1.87)	1.42** (1.09 to 1.85)
	Not weighed/don't know		1.10 (0.83 to 1.45)	1.11 (0.82 to 1.49)	1.09 (0.81 to 1.47)
Sex of child	Male		1	1	1
	Female		0.98 (0.86 to 1.10)	0.98 (0.86 to 1.11)	0.97 (0.86 to 1.11)
Birth order	1		1	1	1
	2–3		1.08 (0.91 to 1.28)	1.07 (0.90 to 1.28)	1.08 (0.90 to 1.29)
	≥4		1.06 (0.77 to 1.46)	1.03 (0.74 to 1.45)	1.04 (0.74 to 1.44)
Child was put on the mother's chest and bare skin after birth	No		1	1	1
	Yes		1.29** (1.08 to 1.53)	1.35** (1.12 to 1.61)	1.33** (1.11 to 1.60)
Measures of variance					
Division level					
Variance (95% CI)		0.193 (0.101 to 0.366)	0.174 (0.094 to 0.319)	–	0.178 (0.091 to 0.346)
ICC (95% CI)		0.010 (0.002 to 0.036)	0.009 (0.003 to 0.030)	–	0.009 (0.002 to 0.032)
MOR		1.52	1.49	–	1.49
Cluster level					
Variance (95% CI)		0.535 (0.441 to 0.649)	–	0.558 (0.460 to 0.678)	0.526 (0.427 to 0.649)
ICC (95% CI)		0.062 (0.049 to 0.097)	–	0.087 (0.060 to 0.123)	0.086 (0.059 to 0.123)
MOR		2.00	–	2.03	1.99
Model fit statistics					
AIC		6281.79	6016.82	5989.02	5979.50
Cluster number		675	675	675	675

*p<0.05, **p<0.01, ***p<0.001. Model 0: null model was fitted without explanatory variables.
Model 1: a two-level logistic regression model where the administrative division was considered as a level 2 factor.
Model 2: a two-level logistic regression model where cluster (EAs) was considered as a level 2 factor.
Model 3 (final model): a three-level logistic regression model where the administrative division was considered as level 2 and cluster (EAs) as level 3 factors.

to the different sample sizes, methodology and socio-economic and demographic characteristics, as well as cultural differences.

Regrettably, this study found that mothers who delivered at a hospital or clinic were less likely to practice EIBF compared with those who home delivered. This finding contrasted with prior research undertaken in Bangladesh, Tanzania, Nepal and Ethiopia that found no significant association in the place of delivery.[7,18,38,40] This finding contradicts an Indian study that found that mothers who delivered their children in hospitals were more likely to practice EIBF than mothers who delivered their children at home.[17] However, this finding supports the study by Ahmmed and Manik.[23] Mothers who deliver at an institution are more likely to undergo caesarean/surgical delivery and thus are less likely to practice EIBF.[27,41] Moreover, in developing countries, there is a shortage of skilled birth attendants, especially during deliveries at home,[42] and this might have an impact on EIBF. To improve EIBF, training birth attendants on breastfeeding promotion, education and counselling at the community level could be crucial.[24,43]

The prevalence of EIBF was much reduced among mothers who delivered via caesarean section compared with those who delivered normally. This finding corroborated findings from Bangladesh, Ethiopia, Indonesia and Tanzania.[21,36,44–46] This might be explained by the fact that mothers who give birth by caesarean delivery are away from their newborn baby due to the surgical procedure. Mothers who deliver at an institution are more likely to deliver by caesarean or surgical delivery.[27,41] Since most operations are performed under general anaesthesia, it is difficult for mothers to recover from anaesthesia within 1 h of birth to breastfeed their babies.[23] Thus it is recommended to create awareness of the importance of EIBF among all women and healthcare providers, as well as to provide clear guideline on EIBF after caesarean section.

Babies who had a normal birthweight were more likely to initiate early breastfeeding as compared with low birthweight infants. A similar finding was reported in a study conducted in some sub-Saharan African countries.[20] In contrast, this finding disagreed with a study conducted in Tanzania[40] that revealed that the birthweight of babies has not been statistically associated with EIBF. Finally, similar to an Indonesian study, this study found that a child who had skin-to-skin contact with his/her mother after delivery was ,ore likely to initiating breastfeeding within 1 h of birth.[44] The plausible explanation could be related to heat transfer from the mother to the baby, which enhances the initiation of searching for food in the baby.[47,48] Sometimes skin-to-skin contact immediately after birth is difficult for low birthweight babies, because immediately after birth these babies have different complications that require intensive care.[49] However, according to a previous study in Bangladesh, skin-to-skin contact is an effective method of stabilizing a low birthweight baby immediately after birth.[50] Thus policymakers should focus on implementing interventions for skin-to-skin contact that may also enhance the chances of having EIBF, even among low birthweight babies.

The prevalence of EIBF varied in different administrative divisions of Bangladesh. This finding is consistent with another study conducted in Bangladesh,[22] and these variations may occur due to the availability of National Nutrition Programs (NNPs) at different subdistrict levels in Bangladesh.[23] However, we could not evaluate whether NNPs were available for the mother since the BDHS 2017–2018 did not contain any information about NNPs. The differences in the prevalence of EIBF were also observed in clusters within divisions. Differences in the prevalence of EIBF across different geographical regions might be due to differences in access to health facilities, healthcare-related information, the knowledge of birth attendant healthcare works about EIBF and access to the media.[23,27]

Strengths and limitations

The strengths of this study were the use of the most recent nationally representative data set and the use of multilevel models to consider the division and cluster effect on the determinant factors of EIBF in Bangladesh, which is the appropriate analysis approach for this data set. One of the limitations of this study was that many important clinical and other factors were not assessed, including maternal knowledge of EIBF. The design of this study was cross-sectional and thus no causal relationships can be determined. Based on the findings of this study, health professionals should pay attention to maximisation of ANC visits and minimizing caesarean deliveries. Providing health education on the importance of EIBF in the life of newborn babies and maternal and child mortality would be effective.

Conclusions

In Bangladesh, the prevalence of EIBF has improved slightly, although it remains unacceptably low according to WHO guidelines. Both community and individual factors, including household wealth status, mother's education, ANC visits, place of delivery, mode of delivery, child's birthweight and skin-to-skin contact after delivery were associated with EIBF in children. Therefore policymakers should focus on these factors so that EIBF can be enhanced. Also, public health specialists and policymakers should prioritise the designing of targeted interventions focusing on mothers with lower education, from wealthy families, and who had institutional and caesarean deliveries to improve EIBF in Bangladesh. This study also suggests that in order to improve EIBF across the country, health providers should emphasise skin-to-skin contact after delivery. Also, community awareness programs should be conducted by community health workers and different health-related programs can be broadcast to encourage mothers to receive antenatal care.

Authors' contributions: SaK was responsible for the conceptualization, methodology, formal analysis, data curation, writing of the original draft, review and editing and supervision. AGA, MHAB, NZA and MAR were responsible for writing the original draft and review and editing. SuK was responsible for data curation and writing the original draft. TM was responsible for writing the original draft.

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Ethical approval: We used a secondary data set from the Demographic and Health Surveys (DHS) Programme for this study, which is publicly available upon suitable request. Therefore, further ethical approval was not required. Details of the ethical procedures followed by the DHS Programme can be found in the BDHS report.[27] All the procedures were performed in accordance with the relevant guidelines and regulations.

Data availability: This study utilized publicly available DHS Programme data for Bangladesh, which can be obtained freely from https://dhsprogram.com/. As a third-party user, we do not have permission to share the data publicly on any platform.

References

1 Jana A. Interventions for promoting the initiation of breastfeeding: RHL commentary. WHO Reproductive Health Library. Geneva: World Health Organization; 2009.

2 Wolde T, Birhanu T, Ejeta E. Prevalence and determinants of timely initiation of breastfeeding among lactating mothers of urban dwellers in western Ethiopia: a community based cross sectional study. Food Sci Qual Manag. 2014;31:110–6.

3 World Health Organization. Essential nutrition actions: improving maternal, newborn, infant and young child health and nutrition. Geneva: World Health Organization; 2013.

4 Thapa B. Health factors in colostrum. Indian J Pediatr. 2005;72(7):579–81.

5 Bayissa ZB, Gelaw BK, Geletaw A, et al. Knowledge and practice of mothers towards exclusive breastfeeding and its associated factors in Ambo Woreda West Shoa Zone Oromia Region, Ethiopia. Int J Res Dev Pharm Life Sci. 2015;4(3):1590–7.

6 Edmond KM, Zandoh C, Quigley MA, et al. Delayed breastfeeding initiation increases risk of neonatal mortality. Pediatrics. 2006;117(3):e380–6.

7 Adhikari M, Khanal V, Karkee R, et al. Factors associated with early initiation of breastfeeding among Nepalese mothers: further analysis of Nepal Demographic and Health Survey, 2011. Int Breastfeed J. 2014;9(1):21.

8 Pösö T, Skivenes M, Hestbæk A-D. Child protection systems within the Danish, Finnish and Norwegian welfare states—time for a child centric approach? Eur J Soc Work. 2014;17(4):475–90.

9 Bosi ATB, Eriksen KG, Sobko T, et al. Breastfeeding practices and policies in WHO European region member states. Public Health Nutr. 2016;19(4):753–64.

10 Alebel A, Dejenu G, Mullu G, et al. Timely initiation of breastfeeding and its association with birth place in Ethiopia: a systematic review and meta-analysis. Int Breastfeed J. 2017;12:44.

11 Berde AS, Yalcin SS. Determinants of early initiation of breastfeeding in Nigeria: a population-based study using the 2013 demographic and health survey data. BMC Pregnancy Childbirth. 2016;16:32.

12 Hassan AA, Taha Z, Ahmed MAA, et al. Assessment of initiation of breastfeeding practice in Kassala, Eastern Sudan: a community-based study. Int Breastfeed J. 2018;13:34.

13 Mukora-Mutseyekwa F, Gunguwo H, Mandigo RG, et al. Predictors of early initiation of breastfeeding among Zimbabwean women: secondary analysis of ZDHS 2015. Matern Health Neonatol Perinatol. 2019;5:2.

14 Nkoka O, Ntenda PA, Kanje V, et al. Determinants of timely initiation of breast milk and exclusive breastfeeding in Malawi: a population-based cross-sectional study. Int Breastfeed J. 2019;14:37.

15 Tongun JB, Sebit MB, Mukunya D, et al. Factors associated with delayed initiation of breastfeeding: a cross-sectional study in South Sudan. Int Breastfeed J. 2018;13:28.

16 Arts M, Taqi I, Bégin F. Improving the early initiation of breastfeeding: the WHO-UNICEF Breastfeeding Advocacy Initiative. Breastfeed Med. 2017;12(6):326–7.

17 Sharma A, Thakur PS, Tiwari R, et al. Factors associated with early initiation of breastfeeding among mothers of tribal area of Madhya Pradesh, India: a community based cross sectional study. Int J Community Med Public Health. 2016;3(1):194–9.

18 Islam MA, Mamun A, Hossain MM, et al. Prevalence and factors associated with early initiation of breastfeeding among Bangladeshi mothers: a nationwide cross-sectional study. PLoS One. 2019;14(4):e0215733.

19 National Institute of Population Research and Training (NIPORT), Mitra and Associates, and ORC Macro. Bangladesh Demographic and Health Survey 2004. Dhaka, Bangladesh and Calverton, Maryland [USA]: National Institute of Population Research and Training, Mitra and Associates, and ORC Macro; 2005. http://maternalnutritionsouthasia.com/wp-content/uploads/Bangladesh-DHS-2004.pdf.

20 Teshale AB, Tesema GA. Timely initiation of breastfeeding and associated factors among mothers having children less than two years of age in sub-Saharan Africa: a multilevel analysis using recent Demographic and Health Surveys data. PLoS One. 2021;16(3):e0248976.

21 Tewabe T. Timely initiation of breastfeeding and associated factors among mothers in Motta town, East Gojjam zone, Amhara regional state, Ethiopia, 2015: a cross-sectional study. BMC Pregnancy Childbirth. 2016;16:314.

22 Islam MA, Mamun A, Hossain MM, et al. Prevalence and factors associated with early initiation of breastfeeding among Bangladeshi mothers: a nationwide cross-sectional study. PLoS One. 2019;14(4):e0215733.

23 Ahmmed F, Manik MMR. Trends in early initiation of breastfeeding in Bangladesh and a multilevel analysis approach to find its determinants. Sci Rep. 2021;11(1):5053.

24 Karim F, Khan ANS, Tasnim F, 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(7):e0220224.

25 Khan HR, Shaw E. Multilevel logistic regression analysis applied to binary contraceptive prevalence data. J Data Sci. 2011;9(1):93–110.

26 Sen KK, Mallick TS, Bari W. Gender inequality in early initiation of breastfeeding in Bangladesh: a trend analysis. Int Breastfeed J. 2020;15:1811.

27 National Institute of Population Research and Training (NIPORT), and ICF. Bangladesh Demographic and Health Survey 2017-18. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT and ICF; 2020. https://dhsprogram.com/pubs/pdf/fr265/fr265.pdf.

28 World Health Organization. Global strategy for infant and young child feeding. Geneva: World Health Organization; 2003.

29 Karim F, Khan ANS, Tasnim F, 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(7):e0220224.

30 Ali M, Amin M, Jarl J, et al. Maternal health status and household food security on determining childhood anemia in Bangladesh – a nationwide cross-sectional study. BMC Public Health. 2021;21:1581.

31 Aldous MB, Edmonson MB. Maternal age at first childbirth and risk of low birth weight and preterm delivery in Washington State. JAMA. 1993;270(21):2574–7.

32 World Health Organization. World Health Organization BMI classification. Geneva: World Health Organization; 2020.

33 Menon P, Nguyen PH, Saha KK, et al. Impacts on breastfeeding practices of at-scale strategies that combine intensive interpersonal counseling, mass media, and community mobilization: results of cluster-randomized program evaluations in Bangladesh and Viet Nam. PLoS Med. 2016;13(10):e1002159.

34 Adewuyi EO, Zhao Y, Khanal V, et al. Rural-urban differences on the rates and factors associated with early initiation of breastfeeding in Nigeria: further analysis of the Nigeria demographic and health survey, 2013. Int Breastfeed J. 2017;12:51.

35 Mangasaryan N, Martin L, Brownlee A, et al. Breastfeeding promotion, support and protection: review of six country programmes. Nutrients. 2012;4(8):990–1014.

36 Gebremeskel SG, Gebru TT, Gebrehiwot BG, et al. Early initiation of breastfeeding and associated factors among mothers of aged less than 12 months children in rural eastern zone, Tigray, Ethiopia: cross-sectional study. BMC Res Notes. 2019;12:671.

37 Hanson LÅ, Korotkova M. The role of breastfeeding in prevention of neonatal infection. Semin Neonatol. 2002;7(4):275–81.

38 Bimerew A, Teshome M, Kassa GM. Prevalence of timely breastfeeding initiation and associated factors in Dembecha district, North West Ethiopia: a cross-sectional study. Int Breastfeed J. 2016;11:28.

39 Rahman MA, Rahman MA, Rawal LB, et al. Factors influencing place of delivery: evidence from three south-Asian countries. PLoS One. 2021;16(4):e0250012.

40 Ali F, Mgongo M, Mamseri R, et al. Prevalence of and factors associated with early initiation of breastfeeding among women with children aged <24 months in Kilimanjaro region, northern Tanzania: a community-based cross-sectional study. Int Breastfeed J. 2020;15:80.

41 National Institute of Population Research and Training (NIPORT), Mitra and Associates, ICF International. Bangladesh Demographic and Health Survey 2014. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT, Mitra and Associates, and ICF International; 2016.

42 Ndirangu M, Gatimu S, Mwinyi H, et al. Trends and factors associated with early initiation of breastfeeding in Namibia: analysis of the Demographic and Health Surveys 2000–2013. BMC Pregnancy Childbirth. 2018;18:171.

43 Islam N, Islam MT, Yoshimura Y. Practices and determinants of delivery by skilled birth attendants in Bangladesh. Reprod Health. 2014;11:86.

44 Gayatri M, Dasvarma GL. Predictors of early initiation of breastfeeding in Indonesia: a population-based cross-sectional survey. PLoS One. 2020;15(9):e0239446.

45 Lyellu HY, Hussein TH, Wandel M, et al. Prevalence and factors associated with early initiation of breastfeeding among women in Moshi municipal, northern Tanzania. BMC Pregnancy Childbirth. 2020;20:285.

46 Tilahun G, Degu G, Azale T, et al. Prevalence and associated factors of timely initiation of breastfeeding among mothers at Debre Berhan town, Ethiopia: a cross-sectional study. Int Breastfeed J. 2016;11:27.

47 Jonas W, Wiklund I, Nissen E, et al. Newborn skin temperature two days postpartum during breastfeeding related to different labour ward practices. Early Hum Dev. 2007;83(1):55–62.

48 Price DL, Gwin JF. Pediatric nursing: an introductory text, 10th edn. St. Louis: Elsevier Health Sciences; 2008.

49 WHO Immediate KMC Study Group. Immediate "kangaroo mother care" and survival of infants with low birth weight. N Engl J Med. 2021;384(21):2028–38.

50 Rahman M, Chowdhury M, Hoque M, et al. Kangaroo mother care for low birth weight babies: a randomized controlled trial in a tertiary care hospital of Bangladesh. J Pediatr Neonat Care. 2017;7(2):00285.