

BMJ Open Effects of maternal education on early initiation and exclusive breastfeeding practices in sub-Saharan Africa: a secondary analysis of Demographic and Health Surveys from 2015 to 2019

Wako Golicha Wako ¹, Zelalem Wayessa,² Anteneh Fikrie ¹

To cite: Wako WG, Wayessa Z, Fikrie A. Effects of maternal education on early initiation and exclusive breastfeeding practices in sub-Saharan Africa: a secondary analysis of Demographic and Health Surveys from 2015 to 2019. *BMJ Open* 2022;**12**:e054302. doi:10.1136/bmjopen-2021-054302

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-054302>).

Received 08 June 2021
Accepted 28 February 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹School of Public Health, Bule Hora University, Bule Hora, Oromia Regional State, Ethiopia
²Department of Midwifery, Bule Hora University, Bule Hora, Oromia Regional State, Ethiopia

Correspondence to
Wako Golicha Wako;
bwakot730@gmail.com

ABSTRACT

Background Early initiation of breast feeding (EIBF) and exclusive breast feeding (EBF) are the cheapest, feasible and simplest nutritional interventions for infants. Effects of maternal education on EIBF and EBF are not consistent across studies. This study assessed the effects of maternal education on EIBF and EBF.

Methods A cross-sectional study was done based on data collected for phase 7 Demographic and Health Surveys conducted in 16 sub-Saharan African countries from 2015 to 2019. Data of the last-born children younger than 6 (n=19 103) and 24 (n=75 293) months were analysed to assess associations between maternal education and EIBF and EBF practices, respectively. To assess the associations, X² test and logistic regression were done. Adjusted ORs (AORs) and their 95% CIs were used to declare statistical significance of the associations.

Results After controlling for all other potentially confounding variables, mothers who completed primary school were 1.29 (95% CI AOR: 1.24 to 1.34) times more likely to initiate breast feeding within the first 1 hour of delivery compared with mothers without education. However, mothers with secondary (AOR: 1.01; 95% CI: 0.96 to 1.06) or higher (AOR: 0.96; 95% CI: 0.87 to 1.05) level of education were not significantly different from mothers without education concerning EIBF. Similarly, mothers educated to primary school were 1.37 (95% CI AOR: 1.27 to 1.48) times more likely to exclusively breast feed compared with mothers without education. However, mothers educated to secondary (AOR: 1.07; 95% CI: 0.98 to 1.17) or higher (AOR: 1.07; 95% CI: 0.89 to 1.27) level of education were not significantly different from uneducated mothers regarding EBF practices.

Conclusions Effects of maternal education on EIBF and EBF depend on the level of educational attainment. Future studies should look for reasons for the lower rate of EIBF and EBF among mothers with higher educational status.

INTRODUCTION

Early initiation of breast feeding (EIBF) and exclusive breast feeding (EBF) are the cheapest, most feasible and simplest nutritional interventions for infants.^{1–3} EBF is the provision of only breast milk for infants

Strengths and limitations of this study

- This analysis was based on a large sample of infants representative of 16 countries in sub-Saharan Africa.
- The analysis was based on the most recent survey data collected from the region.
- All countries in the region were not represented.
- Breastfeeding data were collected based on maternal recall.
- The analysis was based on surveys conducted cross-sectionally and therefore causal inference cannot be made.

to provide complete nutrition during the first 6 months of life²; whereas EIBF is the provision of mothers' breast milk to infants within 1 hour of birth.^{1 2} Current evidence revealed that breast feeding improves cognition, academic performance and nutritional status, and fosters growth of children and is associated with higher income during adulthood.^{1–3} Babies who were breast fed perform better on intelligence tests; are less likely to be overweight or obese; and are less likely to develop diabetes later in life.⁴ Appropriate breast feeding is one of the key areas to improve child survival and promote healthy growth and development. It remains the preferred mode of infant feeding in almost all circumstances.¹ Moreover, it can prevent the annual death of more than 800 000 under-5 children globally.⁵ The WHO currently promotes EBF during the first 6 months of life to achieve optimal growth, development and health. Breast milk is also a crucial source of energy and nutrients during illness and reduces mortality risk among children who are malnourished.¹

According to UNICEF and WHO estimates, merely three in seven (42%) neonates were



breast fed within the first hour of their life,⁶ and only about 44% of infants aged 0–6 months were exclusively breast fed during the period from 2015 to 2020 worldwide.¹ Secondary analysis of Demographic and Health Surveys (DHS) data from 57 low/middle-income countries in 2018 also reported that only 39% of infants were breast fed within 1 hour of birth.⁷

Statuses of breastfeeding practices in different contexts of sub-Saharan Africa are more or less similar. In Ethiopia, about 73% of babies started breast feeding within the first hour of birth and 58% of babies were exclusively breast fed for the first 6 months of life in 2016.⁸ The percentage of children who started breast feeding within 1 hour of birth declined to 72%, whereas the percentage of EBF increased to 59% in 2019.⁹ Although the proportion of exclusively breastfed children in Ethiopia is above the WHO's target of achieving 50% by 2025,¹⁰ overall national EBF progress has been extremely slow since 2016.⁹ Despite early attainment of the WHO's target, a sizeable proportion of infants in Ethiopia are fed with liquids other than breast milk such as water (14%) and other milk (8%) during the first 6 months of age.⁹ Similarly in Ghana, one of the most populous sub-Saharan African countries, 63.4% of infants started breast feeding within 1 hour of birth and 66% of infants were exclusively breast fed during the first 6 months of life.¹¹

Maternal education is an important indicator of socio-economic status, which can affect health behaviour and also improve understanding of the health benefits of breast feeding.^{12–13} Maternal education has been an important investment to improve maternal and child health including breastfeeding practices as it is expected to improve general health literacy. Though studies have shown that maternal education significantly improves EIBF and EBF,^{14–16} this effect has not been consistently reported across studies. While several studies reported a positive association between maternal education and EIBF^{14–17} and EBF,¹⁵ others reported that maternal education, after a certain level, either has no association or a negative association with EIBF and EBF.^{11–18–20} Thus, it is essential to assess the effects of maternal education on EIBF and EBF by using a representative and large sample size. Therefore, this study assessed the effects of maternal education on EIBF and EBF using DHS data collected from sub-Saharan Africa.

METHODS AND MATERIALS

Settings

Sub-Saharan Africa is a region in the African continent located at the southern part of the Sahara desert. It consists of 48 out of 55 African countries. According to the World Bank report, the region had approximately 1.1 billion people in 2019. It is one of the least developed regions of the world with per capita gross national income of US\$1554.6. In the region, the life expectancy at birth is approximately 61.6 years. Approximately 61%

Table 1 List of surveys included in the analysis by country, year of data collection and contribution to total sample size (2015–2019)

Country	Year of data collection	Sample size for EIBF	Sample size for EBF
Angola	2015/2016	5837	1612
Benin	2017/2018	5486	1377
Burundi	2016/2017	5261	12324
Cameroon	2018	3788	984
Ethiopia	2016	4081	1092
Guinea	2018	3066	915
Malawi	2016	6683	1635
Mali	2018	3926	997
Nigeria	2018	12818	3189
Senegal	2019	2465	618
Sierra Leone	2018	3970	991
South Africa	2016	1376	346
Tanzania	2015/2016	4219	1015
Uganda	2016	5992	1478
Zambia	2018	3958	1019
Zimbabwe	2015	2367	603
Total		75293	19103

EBF, exclusive breast feeding; EIBF, early initiation of breast feeding.

of births were attended by a skilled health provider in the region in 2018.²¹

Study design

A cross-sectional study was done based on data collected for phase 7 DHS conducted in 16 sub-Saharan African countries from 2015 to 2019.

Study populations and sample size

Data of last-born children younger than 6 and 24 months who ever breast fed were analysed to assess the association between maternal education, and EIBF and EBF practices, respectively. Data of children who were never breast fed were excluded from the analysis. All phase 7 standard DHS data collected from the region were included in the study except surveys from Ghana, Kenya, Chad, Lesotho and Rwanda, which were excluded because they did not report the age of the children (table 1). Data of 75 293 children aged 0–23 months were used to assess the effects of maternal education on EIBF, and similarly data of 19 103 last-born children aged 0–5 months living with their mothers during the survey period were used to assess the effects of maternal education on EBF (table 1).

Sampling procedures

Within all countries, DHS follow the same sampling procedures to generate nationally and subnationally (region-wide/statewide) representative data. The surveys follow stratified two-stage sampling methods. The studied

countries are classified into strata based on administrative regions/states and place of residence (urban/rural). Each stratum would have several enumeration areas (EAs). In the first stage of sampling, a predetermined number of EAs are selected from each stratum using the probability proportional to size method. Then, within selected EAs, complete household listing is done. In the second stage of sampling, a predetermined number of households are selected from the selected EAs by systematic random sampling.

Data source and extraction

This study used child data from the DHS of 16 sub-Saharan African countries, which were downloaded from the Measure DHS website. The data were collected from all children aged 0–59 months born within the previous 5 years as to the surveys' date. To assess the association between maternal education and EIBF, data of last-born children less than 24 months old were selected. To assess the association between maternal education and EBF, data of last-born children less than 6 months and who were living with their mother during the data collection date were selected. Data related to child feeding practices and various sociodemographic variables were also extracted from the same data sets. Extracted variables were maternal education, maternal age, child age, time of breastfeeding initiation, child feeding practice within the previous day, maternal work engagement within the last 12 months, sex of the child, maternal marital status, with whom the child lives, place of residence, wealth index, parity of mother, pregnancy intention, subjectively reported birth weight, place of delivery, mode of delivery, antenatal care (ANC), postnatal care (PNC) and birth rank of the child.

Operational definitions

EIBF: is feeding an infant with breast milk within the first 1 hour of delivery. Infants were coded as 'EIBF' if they had started breast feeding within 1 hour of birth. Infants who started breast feeding after 1 hour of birth were coded as 'late initiation of breast feeding'.

EBF: is when an infant aged 0–5 months received only breast milk within the previous 24 hours. Infants were coded exclusively breast fed if they had received no food except breast milk in the 24 hours preceding the interview. Otherwise, they were coded as 'non-exclusive breast feeding'.

Study variables

Outcome variables: EIBF and EBF.

Predictor variable: maternal education.

Potential confounding variables: maternal age, maternal work engagement within the last 12 months, sex of the child, marital status of the mother, place of residence, wealth index, parity of mother, pregnancy intention, subjectively reported birth weight, mode of delivery, place of delivery, ANC, PNC and birth rank of the child.

Data processing and analysis

The first data sets of the countries were downloaded separately in SPSS format and merged into a single data set. Then the data were processed and analysed using SPSS V.20. Descriptive analysis was done to illustrate sociodemographic and obstetric characteristics of mothers/children. The data were presented by statistical tables and texts. To assess the association between breast feeding and maternal education, χ^2 test and logistic regression were done. First, χ^2 test was done to assess the association between maternal education, and EIBF and EBF. Finally, a multivariate logistic regression model was fitted to control for other potential confounding variables. Adjusted ORs (AORs) with 95% CIs and p values were used to declare the statistical significance of the association between maternal education, and EIBF and EBF.

Patient and public involvement

Patients and the public were not involved in any stage of this study.

RESULTS

Sociodemographic characteristics

The mean (\pm SD) age of children aged 0–23 months was 11 (\pm 6.8) months and both sexes were nearly equally represented with a sex ratio (male-to-female) of 1.03. On the other hand, the mean (\pm SD) age of children aged 0–5 months was 2.5 (\pm 1.7) months and both sexes were almost equally represented with a male-to-female ratio of 1.01. The mean (\pm SD) age of mothers was 27.6 (\pm 6.8) years, and nearly two-thirds (63%) and 88.5% of mothers were literate and married, respectively. Almost 70% of children were sampled from rural areas.

Breast feeding of infants

About 96.4% (95% CI: 96.3% to 96.6%) of children younger than 24 months were ever breast fed and 61.1% (95% CI: 60.7% to 61.4%) of these children started breast feeding within 1 hour of delivery. Guinea (44.2%), Nigeria (42.9%) and Senegal (35.8%) were countries with relatively lower rates of early breastfeeding initiation. On the other hand, Burundi (85.6%), Malawi (80.6%) and Sierra Leone (78.8%) had relatively higher rates of early breastfeeding initiation. About half (50.8% (95% CI: 50.1% to 51.5%)) of children aged 0–5 months were exclusively breast fed in sub-Saharan Africa. Burundi (84.3%), Zambia (72.8%) and Uganda (67.1%) had relatively higher rates of EBF practices. Nigeria (31%), Guinea (35.4%) and South Africa (53.5%) had lower rates of EBF practices (table 2).

In sub-Saharan Africa, 96.2% of children aged 0–23 months born to mothers without education were ever breast fed; whereas 97.1%, 95.9% and 95.6% of the children born to mothers who had completed primary, secondary and higher level of education were ever breast fed, respectively. In the region, 57.0% of children aged 0–23 months born to mothers without education received

Table 2 Breastfeeding initiation and exclusive breastfeeding practices in 16 sub-Saharan African countries, 2021

Country	Proportion of children aged 0–23 months started breast feeding within 1 hour of delivery (%) (n=75 293)	Proportion of children aged 0–5 months exclusively breast fed (%) (n=19 103)
Angola	47.4	43.1
Benin	55.3	42.9
Burundi	85.6	84.3
Cameroon	53.5	44.0
Ethiopia	73.1	58.4
Guinea	44.2	35.4
Malawi	80.6	64.0
Mali	66.0	41.9
Nigeria	42.9	31.0
Senegal	35.8	39.6
Sierra Leone	78.8	55.8
South Africa	77.4	35.5
Tanzania	52.1	55.9
Uganda	66.8	67.1
Zambia	77.3	72.8
Zimbabwe	60.3	50.1

first breast milk within 1 hour of delivery; whereas 65.6%, 61.2%, and 59.3% of the children born to mothers who had completed primary, secondary and higher level of education received breast milk within the first 1 hour of delivery. Similarly, 45.3% of children younger than 6 months born to non-educated mothers were exclusively breast fed, and the corresponding figures for children born to mothers with primary, secondary and higher level of education were 57.3%, 50.5%, and 49.5%, respectively.

Association between maternal education, and EIBF and EBF

Results from the X^2 test concluded that there are statistically significant associations between maternal education,

and EIBF ($p=0.000$) and EBF ($p=0.000$) practices in sub-Saharan Africa (table 3).

Multivariable logistic regression was done to control variables that could potentially confound the association between maternal education, and EIBF and EBF. The variables that were considered as potential confounders were maternal age, subjectively reported birth weight of the infant, infant sex, parity, mode of delivery, wealth index, place of residence, maternal work engagement within the previous 12 months of the survey, marital status of the mother, pregnancy intention, ANC, place of delivery, PNC and child's birth rank.

After controlling for all potential confounders, mothers who completed primary school were 1.29 (95% CI AOR: 1.24 to 1.34) times more likely to initiate breast feeding within the first 1 hour of delivery compared with mothers without education. However, mothers who completed secondary (AOR: 1.01; 95% CI: 0.96 to 1.06) or higher (AOR: 0.96; 95% CI: 0.87 to 1.05) level of education were not significantly different from mothers without education with regard to early breastfeeding initiation. Besides maternal education, maternal age, subjectively reported birth weight of the infant, parity, mode of delivery, household wealth index, place of residence, place of delivery, sex of the infant, pregnancy intention, birth rank of the infant, marital status of the mother and working status of the mother within the previous 12 months were found to be significantly associated with EIBF (table 4). Likewise, mothers educated to primary school were 1.37 (95% CI AOR: 1.27 to 1.48) times more likely to exclusively breast feed compared with mothers without education. However, mothers educated to secondary (AOR: 1.07; 95% CI: 0.98 to 1.17) or higher (AOR: 1.07; 95% CI: 0.89 to 1.27) level of education were not significantly different from uneducated mothers regarding EBF practices. Other variables which were significantly associated with EBF include maternal age, subjectively reported birth weight of the infant, household wealth index, place of residence, place of delivery, ANC, PNC, pregnancy intention, birth rank of the infant, marital status of the mother and working status of the mother within the previous 12 months of the surveys' date (table 4).

Table 3 Association between maternal education and early initiation of and exclusive breast feeding in sub-Saharan Africa: results from X^2 test, 2021

Maternal educational status	Early breastfeeding initiation		X^2 test value	P value	Exclusive breast feeding		X^2 test value	P value
	Yes (%)	No (%)			Yes (%)	No (%)		
No education	57.6	42.4	400.9	0.000	45.3	54.7	195.6	0.000
Primary education completed	65.6	34.4			57.3	42.7		
Secondary education completed	61.2	38.8			50.5	49.5		
Higher education completed	59.3	40.7			49.5	50.5		

Table 4 Association between maternal education, and EIBF and EBF in 16 sub-Saharan African countries: results of multivariate logistic regression, 2021

Variable	EIBF (n=75 293)		AOR (95% CI)	EBF (n=19 103)		AOR (95% CI)
	Yes (%)	No (%)		Yes (%)	No (%)	
Maternal educational status						
No education	57.6	42.4	1*	45.3	54.7	1*
Primary education completed	65.6	34.4	1.29 (1.24 to 1.34)†	57.3	42.7	1.37 (1.27 to 1.48)†
Secondary education completed	61.2	38.8	1.01 (0.96 to 1.06)	50.5	49.5	1.07 (0.98 to 1.17)
Higher education completed	59.3	40.7	0.96 (0.87 to 1.05)	49.5	50.5	1.07 (0.89 to 1.27)
Maternal age (years)						
<25	59.9	40.1	1*	50.9	49.1	1*
25–34	61.7	38.3	1.11 (1.06 to 1.17)†	50.2	49.8	1.06 (0.97 to 1.16)
>35	61.8	38.2	1.16 (1.09 to 1.24)†	51.9	48.1	1.18 (1.04 to 1.34)†
Subjectively reported birth weight of an infant						
Large	61.6	38.4	1*	48.6	51.4	1*
Average	62.4	37.6	1.02 (0.98 to 1.06)	52.1	47.9	1.14 (1.06 to 1.22)†
Small	55.9	44.1	0.81 (0.77 to 0.85)†	49.5	50.5	1.05 (0.96 to 1.15)
Parity of mother						
Primiparous	58.7	41.3	1*	51.9	48.1	1*
Multiparous	61.7	38.3	1.11 (1.04 to 1.19)†	50.5	49.5	0.96 (0.85 to 1.09)
Infant sex						
Male	60.8	39.2	1*	50.3	49.7	1*
Female	61.4	38.6	1.04 (1.01 to 1.07)†	51.3	48.7	1.03 (0.97 to 1.10)
Mode of delivery						
Vaginal delivery	62.4	37.6	1*	50.6	49.4	1*
Caesarean delivery	35.4	64.6	0.25 (0.23 to 0.27)†	53.3	46.7	0.99 (0.86 to 1.14)
Wealth index						
Poorest	59.0	41	1*	50.9	49.1	1*
Poor	59.1	40.9	0.94 (0.90 to 0.99)†	48.4	51.6	0.84 (0.77 to 0.92)†
Middle	61.4	38.6	1.02 (0.97 to 1.07)	51.4	48.6	0.92 (0.84 to 1.02)
Rich	62.7	37.3	1.11 (1.05 to 1.17)†	52.0	48	0.97 (0.87 to 1.07)
Richest	64.6	35.6	1.41 (1.32 to 1.51)†	51.8	48.2	1.07 (0.94 to 1.21)
Place of residence						
Urban	59.2	40.8	1*	46.8	53.2	1*
Rural	61.9	38.1	1.4 (1.35 to 1.46)†	52.5	47.5	1.48 (1.37 to 1.60)†
Maternal work engagement within the past 12 months						
Currently working	61.6	38.4	1*	49.4	50.6	1*
Not working	61.1	38.9	1.07 (1.03 to 1.11)†	48.9	51.1	1.07 (0.99 to 1.14)
Working in the past year	59.5	40.5	0.93 (0.87 to 0.99)†	58.6	41.4	1.46 (1.28 to 1.65)†
Have job, but on leave for the last 7 days	54.1	45.9	0.73 (0.67 to 0.80)†	63.9	36.1	1.82 (1.60 to 2.06)†
Marital status of the mother						
Never married	63.6	36.4	1*	54.1	45.9	1*
Married	60.9	39.1	0.77 (0.72 to 0.83)†	49.4	50.6	0.84 (0.75 to 0.96)†
Living with partner	59.3	40.7	0.75 (0.69 to 0.80)†	54.1	45.9	0.98 (0.86 to 1.13)
Others‡	64.5	35.5	0.88 (0.80 to 0.96)†	55.1	44.9	0.93 (0.77 to 1.12)
Pregnancy intention						

Continued

Table 4 Continued

Variable	EIBF (n=75 293)		AOR (95% CI)	EBF (n=19 103)		AOR (95% CI)
	Yes (%)	No (%)		Yes (%)	No (%)	
Wanted then	60.5	39.5	1*	48.5	51.5	1*
Wanted later	61.8	38.2	0.96 (0.92 to 1.00)	55.7	44.3	1.19 (1.10 to 1.28)†
Wanted no more	65.5	34.5	1.13 (1.05 to 1.21)†	58.7	41.3	1.33 (1.16 to 1.51)†
Place of delivery						
Home	49.6	50.4	1*	40.8	59.2	1*
Public health facility	66.9	33.1	2.27 (2.18 to 2.36)†	55.9	44.1	1.72 (1.59 to 1.85)†
Private health facility	62.4	37.6	1.98 (1.86 to 2.11)†	50.3	49.7	1.39 (1.23 to 1.57)†
Other places	57.6	42.4	1.29 (1.14 to 1.47)†	58.1	41.9	1.70 (1.32 to 2.20)†
ANC						
No	52.1	47.9	1*	36.6	63.4	1*
Yes	62.0	38	0.97 (0.92 to 1.03)	52.7	47.3	1.42 (1.27 to 1.58)†
PNC						
No	61.6	38.4	1*	51.5	48.5	1*
Yes	59.4	40.6	0.97 (0.94 to 1.01)	48.3	51.7	0.86 (0.80 to 0.93)†
Birth order						
1	58.7	41.3	1*	51.9	48.1	1*
2	63.0	37.0	1.14 (1.07 to 1.21)†	50.5	49.5	1.05 (0.94 to 1.18)
3	62.7	37.3	1.10 (1.05 to 1.17)†	50.2	49.8	1.06 (0.95 to 1.18)
4	61.9	38.1	1.05 (0.99 to 1.11)	51.8	48.2	1.13 (1.02 to 1.26)†
≥5	60.3	39.7	1.07 (1.03 to 1.12)†	50.0	50	0.93 (0.86 to 1.00)

*set as a reference category

†Significant association with p value less than 0.05

‡Widowed, divorced and separated.

ANC, antenatal care; AOR, adjusted OR; EBF, exclusive breast feeding; EIBF, early initiation of breast feeding; PNC, postnatal care.

DISCUSSION

This study illustrated several significant findings. First, maternal education is positively associated with EIBF and EBF only until primary schooling. Second, after primary school, maternal educational attainment does not have a significant association with EIBF and EBF. Finally, the study results showed that several other variables were significantly associated with EIBF and EBF.

We observed a statistically significant positive association between primary level of education and EIBF. This finding is similar to findings of other studies,^{14 17 22} which reported a higher likelihood of EIBF among mothers with better education compared with uneducated mothers. These studies reported that educated mothers, irrespective of their level of education, were more likely to initiate breast feeding early compared with uneducated mothers. However, unlike those studies, the current study found that mothers with secondary and higher levels of education did not have significantly different early breastfeeding initiation rates compared with uneducated mothers. Only mothers with primary education were better at EIBF compared with uneducated mothers. This might mean that female education as a means of promoting timely initiation of breast feeding may only be impactful until

primary schooling, the point after which the impact may not be absent. Findings similar to this have been reported from sub-Saharan Africa and elsewhere.^{19 23} From these findings, it can be said that increasing the educational status of mothers improves EIBF only until primary school. After attaining a certain level of education, for instance, primary level, further maternal education might negatively affect the timely initiation of breast feeding. Similar to this, a study reported a negative association between maternal education of graduate and postgraduate levels, and EBF as compared with mothers with lower level of education in Saudi Arabia.¹⁸ The current study has a sufficiently large sample size (n=75 293) compared with other studies and also has been controlled for many other variables which might confound the association between maternal education and EIBF. For instance, we have controlled for confounding effects of wealth index, place of residence, maternal work engagement within the last 12 months, place of delivery and many other variables (table 4) in multivariable logistic regression. The large sample size of this study improves the power of the study to detect any true association between variables, which makes the findings from this study better than findings from other studies^{14 17 22} with smaller sample sizes.

After controlling for all other factors, a statistically significant positive association was observed between primary level of education and EBF. Thus, mothers with primary education were more likely to practise EBF compared with mothers without education. We found that mothers with a secondary or higher level of education were not significantly different from mothers without education with respect to the EBF rate. However, some previous studies^{15 16 22} reported that maternal education, irrespective of its level, was positively associated with EBF; whereas maternal illiteracy was associated with a lower rate of EBF. On the other hand, studies conducted in Ghana and Ethiopia reported a negative association between tertiary education and EBF practices.^{11 20} This might be because women with a higher educational level may be occupationally busy and spend much of their time apart from their babies. This in turn makes them commence formula milk or any diet earlier than the recommended time. This might suggest the importance of sufficient postnatal maternity leave as a means of promoting EBF.

Consistent with previous studies, the current study reported a statistically significant positive association between EIBF and older maternal age,^{23 24} female infant,²⁵ rural residence,²³ wealthier household,^{23–25} health facility delivery,^{17 23} mothers not working within the last 12 months and mother on leave for the last 7 days.²⁶ Similarly, in congruence with previous studies, this study found a statistically significant negative association between EIBF and caesarean delivery,^{14 17 18 23–25} small-sized infant during birth^{23 24} and mother in marital union.²⁶ Like findings of previous studies, positive associations were observed between EBF and older maternal age,^{11 27} average-sized infant during delivery, rural residence,²⁸ health facility delivery²⁹ and ANC.³⁰ In this study, we observed significant positive associations between EBF and higher birth order and unwanted pregnancy which were not reported by previous studies. Higher birth order usually happens among older mothers. These older mothers might have better experience and self-efficacy about EBF, which enable them to exclusively breast feed. Infants born from unwanted pregnancy were more likely to be exclusively breast fed than infants born from wanted pregnancy. This finding is in conflict with a previous study, which reported a negative association between unwanted pregnancy and EBF.³⁰ These findings need further study. Similar to previous studies, negative associations were observed between EBF and currently working women,³¹ being married^{32 33} and being in poor households. Women engaged in work might not have sufficient time to stay with their infants and exclusively breast feed. Similar to this, it has been reported that employed women were less likely to exclusively breast feed than either unemployed women or housewives.^{16 29 31} Married women were less likely to practise EBF compared with never-married women. Findings similar to this have been reported previously.^{32 33} The reason why married women are less likely to exclusively breast feed remains unclear and requires further research. A low household economic status might

have a negative impact on EBF practice. Women from poor households might have to resume usual jobs postnatally to feed families and so they may not have adequate time to stay with their infants and provide EBF as desired. A previous study also has reported a negative association between a low household economic status and EBF.¹⁵ In this study, we also found a negative association between PNC and EBF contrary to previous studies.^{30 34} During PNC, counselling about breast feeding is an important component of the services provided. It is expected that the provision of PNC improves breastfeeding practices including EBF. However, our finding is contrary to expectation, which deserves further inquiry.

This study is based on a representative large sample size and covered 33.3% of sub-Saharan African countries using a representatively selected sample. Additionally, the data used in this study were collected recently. The results from this study can be safely generalised to sub-Saharan African countries. The findings are more likely to be precise and detect any true association between variables as the sample size is large. We also controlled for variables that can potentially confound the association between maternal education and breast feeding (EIBF and EBF). However, there are limitations inherent to this study. First, the study was based on data collected by recalling over a period as long as 24 months. So, this might introduce recall bias. Second, we assessed the association between breastfeeding practices and formal education, which might not directly correspond to the health literacy of women. Finally, the data used in this study were collected by cross-sectional surveys and causal inference cannot be made.

CONCLUSION

Children born to mothers with a primary level of education were more likely to have EIBF and EBF in sub-Saharan Africa. However, maternal education beyond primary level seems to have no effect on the EIBF and EBF of their children. Future studies should investigate reasons for the lower rate of EIBF and EBF among mothers with higher educational status.

Acknowledgements We would like to extend our earnest homage to the DHS programme for granting access to the data.

Contributors WGW conceived the project, developed proposal, extract the data, did data analysis and interpretation, and wrote the manuscript. WGW acts as a guarantor for the study. ZW developed proposal, did data analysis and interpretation, and wrote the manuscript. AF developed proposal, did data analysis and interpretation, and wrote the manuscript. All authors read and approved the final manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval We accessed the DHS data after getting permission from the DHS programme. Primary data were collected from each country by adhering to relevant



local and international ethical guidelines. All procedures and questionnaires of DHS are reviewed and approved by the ICF international institutional review board (IRB). Additionally, each country-specific DHS has been reviewed and approved by ICF IRB and an IRB in the host country.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. It is recommended that the first breast feeding should be initiated within 1 hour of delivery. Exclusive breast feeding is an ideal nutrition for infants younger than 6 months. In sub-Saharan Africa, a significant proportion of infants are not exclusively breast fed and/or commence first breast milk within 1 hour of delivery. Maternal education up to primary school significantly improves early initiation and exclusive breastfeeding rates in sub-Saharan Africa. Beyond primary school maternal education does not improve early initiation and exclusive breastfeeding rates in sub-Saharan Africa.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Wako Golicha Wako <http://orcid.org/0000-0002-4438-4304>

Anteneh Fikrie <http://orcid.org/0000-0002-9809-3326>

REFERENCES

- World Health Organization. Infant and young child feeding 2020.
- World Health Organization. Early initiation of breastfeeding to promote exclusive breastfeeding 2021.
- Victora CG, Bahl R, Barros AJD, *et al*. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet* 2016;387:475–90.
- World Health Organization. Breastfeeding, 2021. Available: https://www.who.int/health-topics/breastfeeding#tab=tab_1
- UNICEF. *Breastfeeding: a mother's gift, for every body*. New York, USA, 2018.
- UNICEF, WHO. *Capture the moment: early initiation of breastfeeding, the best start for every newborn*. New York, USA, 2018.
- Oakley L, Benova L, Macleod D, *et al*. Early breastfeeding practices: descriptive analysis of recent demographic and health surveys. *Matern Child Nutr* 2018;14:e12535.
- Central Statistical Agency(Ethiopia). *Ethiopia demographic and health survey 2016*. Addis Ababa, Ethiopia: Central Statistical Agency(Ethiopia), 2016.
- Central Statistical Agency(Ethiopia). *Ethiopia demographic and health survey 2019*. Addis Ababa, Ethiopia: Central Statistical Agency(Ethiopia), 2019.
- WHO, UNICEF. *Global nutrition targets 2025 breastfeeding policy brief*. Geneva, Switzerland, 2014.
- Asare BY-A, Preko JV, Baafi D, *et al*. Breastfeeding practices and determinants of exclusive breastfeeding in a cross-sectional study at a child welfare clinic in Tema Manhean, Ghana. *Int Breastfeed J* 2018;13:12.
- Sadia S, Rukhsana R, Sarah T. Impact of maternal education and source of knowledge on breast feeding practices in Rawalpindi City. *MOJ Curr Res Rev* 2018;1:212–42.
- van Rossem L, Oenema A, Steegers EAP, Jaddoe HA, *et al*. Are starting and continuing breastfeeding related to educational background? the generation R study. *Pediatrics* 2009;123:e1017–27.
- Gebremeskel SG, Gebbru 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.
- Jama A, Gebreyesus H, Wubayehu 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.
- Laksono AD, Wulandari RD, Ibad M, *et al*. The effects of mother's education on achieving exclusive breastfeeding in Indonesia. *BMC Public Health* 2021;21:14.
- Acharya P, Khanal V. The effect of mother's educational status on early initiation of breastfeeding: further analysis of three consecutive Nepal demographic and health surveys. *BMC Public Health* 2015;15:1069.
- Ahmed AE, Salih OA. Determinants of the early initiation of breastfeeding in the Kingdom of Saudi Arabia. *Int Breastfeed J* 2019;14:13.
- Hernández-Vásquez A, Chacón-Torrico H. Determinants of early initiation of breastfeeding in Peru: analysis of the 2018 demographic and family health survey. *Epidemiol Health* 2019;41:e2019051.
- Kasahun AW, Wako WG, Gebere MW, *et al*. Predictors of exclusive breastfeeding duration among 6-12 month aged children in gurage zone, South Ethiopia: a survival analysis. *Int Breastfeed J* 2016;12:20.
- World Bank Development Indictaors [Internet], 2021 [Accessed cited 12th May 2021].
- Tang K, Wang H, Tan SH, *et al*. Association between maternal education and breast feeding practices in China: a population-based cross-sectional study. *BMJ Open* 2019;9:e028485.
- 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:e0248976.
- Hadisyatmana S, Has EMM, Sebayang SK, *et al*. Women's Empowerment and determinants of early initiation of breastfeeding: a scoping review. *J Pediatr Nurs* 2021;56:e77–92.
- John JR, Mistry SK, Kebede G, *et al*. Determinants of early initiation of breastfeeding in Ethiopia: a population-based study using the 2016 demographic and health survey data. *BMC Pregnancy Childbirth* 2019;19:69.
- Senanayake P, O'Connor E, Ogbo FA. National and rural-urban prevalence and determinants of early initiation of breastfeeding in India. *BMC Public Health* 2019;19:896.
- Mulatu Dibisa T, Sintayehu Y. Exclusive breast feeding and its associated factors among mothers of <12 months old child in Harar Town, Eastern Ethiopia: a cross-sectional study. *Pediatric Health Med Ther* 2020;11:145–52.
- Um S, Chan YZC, Tol B, *et al*. Determinants of exclusive breastfeeding of infants under six months among Cambodian mothers. *J Pregnancy* 2020;2020:2097285.
- 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.
- Mamo K, Dengia T, Abubeker A, *et al*. Assessment of exclusive breastfeeding practice and associated factors among mothers in West Shoa zone, Oromia, Ethiopia. *Obstet Gynecol Int* 2020;2020:3965873.
- Tewabe T, Mandesh A, Gualu T, *et al*. Exclusive breastfeeding practice and associated factors among mothers in Motta town, East Gojjam zone, Amhara regional state, Ethiopia, 2015: a cross-sectional study. *Int Breastfeed J* 2016;12:12.
- Alemayehu T, Haidar J, Habte D. Determinants of exclusive breastfeeding practices in Ethiopia. *Ethiop J Health Dev* 2009;23.
- Ayalew T. Exclusive breastfeeding practice and associated factors among first-time mothers in Bahir Dar City, North West Ethiopia, removed: a community based cross sectional study. *Heliyon* 2020;6:e04732.
- Teka B, Assefa H, Hailelassie K. Prevalence and determinant factors of exclusive breastfeeding practices among mothers in Enderta woreda, Tigray, North Ethiopia: a cross-sectional study. *Int Breastfeed J* 2015;10:2.