

Research Articles

Association between skin-to-skin contact post-birth and breastfeeding behaviour: a cross-sectional study of Nigerian women using the 2018 Demographic Health Survey

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Background

The World Health Organisation (WHO) recommends skin-to-skin contact at birth as part of the essential newborn care processes that can help improve breastfeeding behaviours in new mothers. In 2019 Nigeria had the highest number of infant mortalities (270,000 infant deaths), second only to India (522,000 infant deaths). Consequently, the possible benefits of skin-to-skin contact and healthy breastfeeding behaviours to both mother and child cannot be overemphasised. This study seeks to understand the rate of skin-to-skin contact post-birth and how this affects early breastfeeding initiation, breastfeeding duration, and exclusive breastfeeding among Nigerian women. It also seeks to understand if the place of delivery or internet access affects the associations between skin-to-skin contact and breastfeeding behaviours.

Methods

Data from the Demographic and Health Survey (2018) on Nigerian women were analyzed, and 19,328 women were included in this study. The association between skin-to-skin contact post-birth (independent variable) and breastfeeding initiation, exclusive breastfeeding, and breastfeeding duration (dependent variables) were analyzed with multivariable logistic regression models adjusted for known confounders. The modifying effects of place of delivery and internet use were also assessed.

Results

Nearly 13% of Nigerian women experienced skin-to-skin contact post-birth. The odds of exclusive breastfeeding were higher for women who experienced skin-to-skin contact with their newborns, compared to those that did not (odds ratio, OR=1.24, 95% confidence interval, CI=1.13-1.36). Conversely, the odds of initiating breastfeeding within the first hour of birth (OR=0.87, 95% CI=0.79-0.96) were lower in women who experienced skin-to-skin contact post-birth. There was no association between skin-to-skin contact and breastfeeding duration. Delivering their baby in private hospitals modified the association between skin-to-skin contact and early breastfeeding initiation (OR=3.27, 95% CI=2.33-4.60, P<0.001), as well as the association between skin-to-skin contact and breastfeeding duration (OR=1.56, 95% CI=1.14-2.15, P=0.008) more strongly than delivering their baby in public hospitals.

Conclusions

In Nigerian women, skin-to-skin contact post-birth is associated with some breastfeeding behaviours (early initiation and exclusive breastfeeding). However, associations between skin-to-skin contact and breastfeeding behaviours of early breastfeeding initiation and breastfeeding duration may be modified by the place of delivery. Therefore, health interventions to increase skin-to-skin contact practices should target skilled health providers, particularly in public hospitals.

Placing a newborn baby on its mother's bare chest immediately after birth,¹ for an hour or till their first feed (skin-to-skin contact),² is classified as an early essential newborn

care by the World health Organisation (WHO).³ It is also part of the WHO's 'Ten steps to successful breastfeeding' found in the 'Baby-Friendly Hospital Initiative'^{2,4} (BFHI),

launched in Nigeria in 1991 to encourage healthier breastfeeding practices.⁵ Established benefits of skin-to-skin contact include increased oxytocin levels which promote breast milk production, increased mother-child bonding, and reduced anxiety in new mothers.⁶ Moreover, it increases the catecholamines levels in the newborns' bloodstream, stimulating their olfactory senses in the first few hours of birth. This sensitized sense of smell helps the newborn root and latch on for their first feed.⁷ Despite its role in reducing child mortality rates⁸ and the other benefits to both the mother and the newborn, skin-to-skin contact is not commonly practised in Nigeria.⁹

The WHO promotes healthy breastfeeding behaviours in the fight against infant/child mortality on a global level⁴ and recommends early breastfeeding in the first hour of birth and exclusive breastfeeding for the first six months after birth.¹⁰ Recent studies confirm the negative effects of delayed initiation of breastfeeding on infant morbidity¹¹ and mortality.¹² However, according to the United Nations Children's Fund (UNICEF), just 17% of newborns in Nigeria are exclusively breastfed for the first six months.¹³ This is a pressing public health issue, especially because Nigeria's infant mortality rate was 74 deaths per 1,000 live births in 2019.¹⁴

Although the association between skin-to-skin contact and individual breastfeeding behaviours in Nigeria have been studied in the past, they have mostly been done at the state or regional level. No study to our knowledge has studied both the prevalence of skin-to-skin contact at birth and the impact of skin-to-skin contact on multiple breastfeeding outcomes (breastfeeding initiation within one hour of birth, breastfeeding for at least six months after birth and giving baby nothing but breastmilk) at the national level using the 2018 Demographic Health Survey (DHS) data for Nigeria. Nor has any previous study assessed the modifying effect of internet use or place of delivery on these individual relationships.

Even though skin-to-skin contact improves breastfeeding outcomes,² recent studies show that only about 10% of newborns experience skin-to-skin contact in Nigeria.⁹ The objective of this study is to assess the rate of skin-to-skin contact among Nigerian women and any association with early breastfeeding initiation, breastfeeding duration and exclusive breastfeeding. This study should also assess the effect of internet use and place of delivery on the association between skin-to-skin contact and the breastfeeding behaviours of interest. This could help inform public health interventions and policy changes that could result in improved newborn care among Nigerian women while reducing the child mortality rate in the country over time.

METHODS

Data was obtained from Nigeria's 2018 cross-sectional Demographic and Health Survey (DHS) dataset, collected between August 14 and December 29, 2018. Study participants were selected through multistage cluster sampling, and the Population and Housing Census of the Federal Republic of Nigeria (NPHC) was used as the sampling frame. The 36 states plus Abuja were stratified into urban and rural areas by the number of households in the 1,400 census enumera-

tion areas (EAs), which were selected by proportional probability. The unit of analysis was women within each given household, and the complete methodology has been outlined elsewhere.¹⁵ Urban areas were identified as localities with a population size of at least 20,000 people. The survey had a 99% response rate, with 40,427 of the 41,668 households selected successfully interviewed. The initial sample consisting of 41,821 women was successfully interviewed for the survey. The DHS calculated sampling weights for the dataset to increase the representativeness and generalizability of the sample to the total population and data used are therefore representative at regional, national and domain levels.¹⁵ Women aged 15-49 years old who had a live birth and had responded to the relevant question about skin-to-skin contact and the breastfeeding behaviour questions were included in the study. We excluded women with missing records for skin-to-skin contact (19,910 women), breastfeeding duration (0), exclusive breastfeeding (646) and breastfeeding initiation (1,937) from the study. No missing data was found for socio-demographics after exclusion criteria were applied. The final sample size used for analyses was 19,328 women.

STUDY VARIABLES

Using a validated questionnaire, the independent variable (skin-to-skin contact) was measured by the categorical response to the question: "Was (NAME)'s bare skin touching your bare skin?" which was a follow-up question to "Immediately after the birth, was (NAME) put on your chest?". The responses were recoded into the dichotomous categories "Bare chest contact" and "No bare chest contact at all". The breastfeeding behaviours (dependent variables) of interest were: 1) Early breastfeeding initiation, which is defined as initiation breastfeeding within one hour of birth² was measured by the length of time between birth and first breastfeeding in hours/days and categorized as " ≤ 1 hour" and " > 1 hour"; 2) Breastfeeding duration, which was measured by the continuous response to the question about the length of time (measured in weeks and months) that mother breastfed her newborn; and 3) Exclusive breastfeeding for the first four to six months¹⁵ measured by the dichotomous response to the question "Was (name) given anything other than breast milk to eat or drink - anything at all like water, infant formula, or [insert common drinks and foods that may be given to newborn infants]?". All dependent variables were recoded into dichotomous response categories respectively, with early breastfeeding initiation recoded into " ≤ 1 hour" and " > 1 hour", breastfeeding duration recoded into " < 6 months" and " ≥ 6 months", and exclusive breastfeeding recoded into "Yes" or "No" categories.

The place of delivery was assessed by the response to the question "Where did you give birth to (NAME)?" ('Private hospital', 'Public hospital' and 'Home/other'). Recent internet use was assessed by the categorical response to the question "How recently did you use the internet in the past 12 months?" ('Never', 'Not recently', 'Recently'). The frequency of internet use was assessed with the question "During the last one month, how often did you use the internet: almost every day, at least once a week, less than once a week, or not at all?" and recoded into ('Never', 'Infrequently' and 'Fre-

quently') respectively.

Sociodemographic variables and potential confounders such as age ('Teenager', 'Young adult' and 'Mature adult'), marital status ('Never married', 'Married/Living with partner', 'Divorced/Separated/Widowed'), socio-economic status (SES) measured as wealth index ('Poor', 'Middle class', 'Rich'),^{16,17} educational attainment ('No formal education', 'Primary education', 'Secondary education' and 'Higher education'), residence by location ('Urban' or 'Rural'), ethnicity ('Igbo', 'Yoruba', 'Hausa/Fulani' and 'Other/Minorities'), religion ('Christianity', 'Islam', 'Traditionalism/Other'), currently working ('Yes', 'No'), and the number of antenatal care (ANC) visits ('<4 visits' and '≥4 visits')^{18,19} were all assessed.

STATISTICAL METHODS

Nigeria's DHS dataset was weighted to improve generalisability.¹⁵ The association between skin-to-skin contact (independent variable) and each dependent variable (early breastfeeding initiation, breastfeeding duration and exclusive breastfeeding) was analyzed using separate multivariate logistic regression models adjusted for the sociodemographic variables and the main confounders listed above. We also analyzed if the associations of interest varied with time or frequency of internet use, and place of delivery by using likelihood ratio tests to compare the fully adjusted models with and without interaction terms. Statistical significance was set at 2-tailed $P \leq 0.05$ for all analyses. The analyses were performed with the program IBM SPSS Statistics for Windows, Version 26.0. (IBM Corp. Armonk, NY, USA. Released 2019).²⁰

ETHICS

The survey protocol for the DHS survey was reviewed and approved by the National Health Research Ethics Committee of Nigeria (NHREC) and the ICF Institutional Review Board¹⁵ (previously named Inner City Fund). Access to de-identified DHS online archives for Nigeria was approved, data confidentiality was upheld, and all other guidelines have been followed. Since we analyzed secondary data retrieved from the 2018 Nigeria Demographic Health Survey, this study was also approved by Adelphi University's Institutional Review Board, who decided that participants' formal consent was not required.

RESULTS

About 12.6% of Nigerian women experienced skin-to-skin contact at birth, over three in five women initiated early breastfeeding (63.7%), approximately one in three women breastfed for at least six months (32.4%), and half the women exclusively breastfed their babies (54.6%) for the first four to six months.

SOCIODEMOGRAPHIC CHARACTERISTICS

[Table 1](#) summarises the socio-demographic information, and health access characteristics of the sample population. The majority of the women in this study were between 20-34 years old (67.2%), married or living with a partner (94.1%), poor (42.4%), had no formal education (42.8%), lived in rural areas (59.5%), were Hausa or Fulani (41.7%), practised Islam (60.2%), were working at the time of survey (69%) or made more than four ANC visits (57.9%). In addition, over half the women had their babies at home (57.7%), and 89.9% had never used the internet.

Among women who initiated early breastfeeding, 12.6% experienced skin-to-skin contact, more than three in five were young adults (66.9%), over nine in ten were married or living with their partner (93.6%). Additionally, about 41.2% were rich, 39.2% had no formal education, 56.8% were rural dwellers, while 11.9% were Igbo, 16.6% Yoruba, and 36.2% Hausa/Fulani. Over half of them practised Islam (56.7%), less than half were Christians (42.6%), 70.9% were working at the time of the survey, 40.1% made less than four ANC visits while pregnant, 54.6% used ANC services at home, and 11.4% recently used the internet.

Among women who breastfed for six months or more, only 12.6% experienced skin-to-skin contact. About 71% were young adults between 20-34 years old, 95.7% were married or living with their partner, approximately half of them had no formal education (50.9%), and over three in five were rural dwellers (65.9%). About 49.3% were Hausa/Fulani, 9.3% Igbo, 9.6% Yoruba, 30.5% were Christians and 68.9% practised Islam. Around 54.3% made at least four ANC visits, 26.5% gave birth in a public hospital, and 6.8% recently used the internet.

About 14.5% of women who exclusively breastfed, experienced skin-to-skin contact at birth. Among those who exclusively breastfed, over three in five were young adults (68.1%), 93.7% were married or living with their partner, 37.2% were poor, 34.7% had no formal education, 54.8% lived rurally, 12.9% were Igbo and 19.4% Yoruba. Around 54.4% practised Islam, 64% made at least four ANC visits, 34.3% gave birth in public hospitals and 13% recently used the internet.

ASSOCIATION BETWEEN SKIN-TO-SKIN CONTACT, BREASTFEEDING BEHAVIOURS.

After adjusting for main confounders, the odds of early breastfeeding initiation (odds ratio, OR=0.87, 95% confidence interval, CI=0.79-0.96) were significantly lower (13%) in women who had skin-to-skin contact with their newborn at birth than in those who did not ([Table 2](#)). Conversely, the odds of exclusive breastfeeding were significantly higher (24%) in women who had skin-to-skin contact with their newborn (OR=1.24, 95% CI=1.1-1.36) compared to those who did not. There was no statistically significant association between skin-to-skin contact and breastfeeding duration.

Table 1. Characteristics of the study participants by breastfeeding behaviours^a

	Total n (%)	Early breastfeeding initiation n (%)		Breastfeeding duration n (%)		Exclusive breastfeeding n (%)	
		≤1 hour (63.7%) (n = 12,313)	>1 hour (36.3%) (n = 7015)	<6 months (67.6%) (n = 13,071)	≥6 months (32.4%) (n = 6,256)	Yes (54.6%) (n = 10,554)	No (45.4%) (n = 8774)
Skin-to-skin contact after birth							
No	16,883 (87.4%)	10,764 (87.2%)	6,119 (87.2%)	11,416 (87.3%)	5,467 (87.4%)	9,026 (85.5%)	7,857 (89.5%)
Yes	2,445 (12.6%)	1549 (12.6%)	896 (12.8%)	1,655 (12.7%)	789 (12.6%)	1,528 (14.5%)	917 (10.5%)
Socio-demographics							
Mother's Age							
Teenager (15 - 19 years)	993 (5.1%)	555 (4.5%)	438 (6.2%)	548 (42%)	446 (7.1%)	453 (4.3%)	541 (6.2%)
Young adult (20 - 34 years)	12,988 (67.2%)	8,240 (66.9%)	4,748 (67.7%)	8,544 (65.4%)	4,444 (71.0%)	7,188 (68.1%)	5,800 (66.1%)
Mature adult (35 - 44 years)	5,346 (27.7%)	3,518 (28.6%)	1,828 (26.1%)	3,979 (30.4%)	1,367 (21.8%)	2,913 (27.6%)	2,433 (27.7%)
Marital status							
Never married	457 (2.4%)	308 (2.5%)	149 (2.1%)	342 (2.6%)	115 (1.8%)	290 (2.4%)	168 (1.9%)
Married/Living with partner	18,192 (94.1%)	11,565 (93.6%)	6,627 (94.5%)	12,202 (93.4%)	5,990 (95.7%)	9,887 (93.7%)	8,306 (94.7%)
Divorced/Separated / Widowed	678 (3.5%)	440 (3.6%)	239 (3.4%)	527 (4.0%)	151 (2.4%)	378 (3.6%)	301 (3.4%)
Wealth Index (SES^b)							
Poor	8,200 (42.4%)	4626 (37.6%)	3574 (50.9%)	5,105 (39.1%)	3,094 (49.5%)	3,930 (37.2%)	4,270 (48.7%)
Middle Class	3,943 (20.4%)	2618 (21.3%)	1325 (18.9%)	2,636 (20.2%)	1,307 (20.9%)	2,081 (19.7%)	1,862 (21.2%)
Rich	7,185 (37.2%)	5069 (41.2%)	2116 (30.2%)	5,331 (40.8%)	1,855 (29.7%)	4,543 (43.0%)	2,642 (30.1%)
Educational attainment							

No formal education	8,273 (42.8%)	4,832 (39.2%)	3,441 (49.1%)	5,088 (38.9%)	3,185 (50.9%)	3,662 (34.7%)	4,611 (52.5%)
Primary	2,981 (15.4%)	1,914 (15.5%)	1,067 (15.2%)	2,094 (16.0%)	887 (14.2%)	1,761 (16.7%)	1,220 (13.9%)
Secondary	6,311 (32.7%)	4,348 (35.3%)	1,963 (28.0%)	4,506 (34.5%)	1,805 (28.8%)	3,979 (37.7%)	2,333 (26.6%)
Higher	1,763 (9.1%)	1,219 (9.9%)	544 (7.8%)	1,383 (10.6%)	380 (6.1%)	1,152 (10.9%)	611 (7.0%)
Residence							
Urban	7,823 (40.5%)	5,323 (43.2%)	2,500 (35.6%)	5,691 (43.5%)	2,132 (34.1%)	4,768 (45.2%)	3,055 (34.8%)
Rural	11,505 (59.5%)	6,991 (56.8%)	4,514 (64.4%)	7,380 (56.5%)	4,124 (65.9%)	5,786 (54.8%)	5,719 (65.2%)
Ethnicity							
Igbo	2,432 (12.6%)	1,469 (11.9%)	963 (13.7%)	1,853 (14.2%)	579 (9.3%)	1,365 (12.9%)	1,067 (12.2%)
Yoruba	2,605 (13.5%)	2,041 (16.6%)	563 (8.0%)	2,002 (15.3%)	603 (9.6%)	2,048 (19.4%)	557 (6.3%)
Hausa/Fulani	8,068 (41.7%)	4,457 (36.2%)	3,611 (51.5%)	4,981 (38.1%)	3,087 (49.3%)	3,674 (34.8%)	4,394 (50.1%)
Other/ Minorities	6,223 (32.2%)	4,346 (35.3%)	1,876 (26.8%)	4,236 (32.4%)	1,987 (31.8%)	3,467 (32.9%)	2,756 (31.4%)
Religion							
Christianity	7,578 (39.2%)	5,245 (42.6%)	2,334 (33.3%)	5,669 (43.4%)	1,909 (30.5%)	4,775 (45.2%)	2,803 (31.9%)
Islam	11,638 (60.2%)	6,983 (56.7%)	4,655 (66.4%)	7,329 (56.1%)	4,309 (68.9%)	5,743 (54.4%)	5,895 (67.2%)
Traditionalism/ Other	111 (0.6%)	86 (0.7%)	26 (0.4%)	73 (0.6%)	39 (0.6%)	36 (0.3%)	76 (0.9%)
Currently Working							
No	5,997 (31.0%)	3,581 (29.1%)	2,416 (34.4%)	3,806 (29.1%)	2,191 (35.0%)	2,960 (28.0%)	3,037 (34.6%)
Yes	13,331 (69.0%)	8,733 (70.9%)	4,598 (65.6%)	9,266 (70.9%)	4,065 (65.0%)	7,594 (72.0%)	5,737 (65.4%)
ANC ^c visits during pregnancy							
<4 visits	8,136	4,932	3,203	5,275	2,861	3,801	4,335

	(42.1%)	(40.1%)	(45.7%)	(40.4%)	(45.7%)	(36.0%)	(49.4%)
≥4 visits	11,192 (57.9%)	7,381 (59.9%)	3,811 (54.3%)	7,797 (59.6%)	3,395 (54.3%)	6,753 (64.0%)	4,439 (50.6%)
<i>Other Covariates</i>							
<i>Place of delivery</i>							
Private hospital	2,614 (13.5%)	1,744 (14.2%)	870 (12.4%)	1,968 (29.9%)	646 (10.3%)	1,592 (15.1%)	1,022 (11.6%)
Public hospital	5,570 (28.8%)	3,850 (31.3%)	1,721 (24.5%)	3,915 (29.9%)	1,656 (26.5%)	3,621 (34.3%)	1,949 (22.2%)
Home/Other	11,144 (57.7%)	6,719 (54.6%)	4,424 (63.1%)	1,789 (55.0%)	3,955 (63.2%)	5,341 (50.6%)	5,803 (66.1%)
<i>Last time Internet used</i>							
Never	17,383 (89.9%)	10,723 (87.1%)	6,250 (89.1%)	11,206 (85.7%)	5,767 (92.2%)	8,964 (84.9%)	8,009 (91.3%)
Not recently	312 (1.6%)	186 (1.5%)	126 (1.8%)	247 (1.9%)	65 (1.0%)	217 (2.1%)	95 (1.1%)
Recently	2,042 (10.6%)	1,404 (11.4%)	638 (9.1%)	1,618 (12.4%)	424 (6.8%)	1,373 (13.0%)	669 (7.6%)
<i>Frequency of Internet use</i>							
Never	17,383 (89.9%)	10,973 (89.1%)	6,410 (91.4%)	11,523 (88.2%)	5,859 (93.7%)	9,246 (87.6%)	8,136 (92.7%)
Infrequent	1,033 (5.3%)	741 (6.0%)	292 (4.2%)	824 (6.3%)	210 (3.4%)	736 (7.0%)	297 (3.4%)
Frequent	912 (4.7%)	599 (4.9%)	312 (4.4%)	725 (5.5%)	187 (3.0%)	571 (5.4%)	341 (3.9%)

^a Unweighted sample counts (weighted percentages).

^b SES: Socioeconomic status.

^c ANC: Antenatal Care.

Table 2. Association between skin-to-skin contact and breastfeeding behavior(s) in Nigerian women.

	Early breastfeeding initiation ^a		Breastfeeding duration		Exclusive breastfeeding	
	OR ^b (95% CI ^c)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Skin-to-Skin contact after birth						
No	1 (Reference)		1 (Reference)		1 (Reference)	
Yes	0.87 (0.79 – 0.96)	0.004	1.02 (0.93 – 1.13)	0.628	1.24 (1.13 – 1.36)	0.000
Mother's Age						
Teenager (15 – 19 years)	1 (Reference)		1 (Reference)		1 (Reference)	
Young adult (20 – 34 years)	1.15 (1.01 – 1.32)	0.036	0.74 (0.65 – 0.85)	0.000	1.22 (1.06 – 1.39)	0.004
Mature adult (35 – 44 years)	1.25 (1.08 – 1.44)	0.003	0.50 (0.43 – 0.58)	0.000	1.17 (1.02 – 1.35)	0.030
Marital status						
Never married	1 (Reference)		1 (Reference)		1 (Reference)	
Married/Living with partner	1.07 (0.87 – 1.32)	0.505	1.25 (1.00 – 1.56)	0.050	0.95 (0.78 – 1.16)	0.622
Divorced/Separated/Widowed	1.07 (0.82 – 1.39)	0.618	0.81 (0.61 – 1.08)	0.149	0.90 (0.70 – 1.16)	0.404
Wealth Index (SES) ^d						
Poor	1 (Reference)		1 (Reference)		1 (Reference)	
Middle	1.43 (1.31 – 1.56)	0.000	0.94 (0.86 – 1.02)	0.146	0.89 (0.82 – 0.97)	0.006
Rich	1.68 (1.52 – 1.85)	0.000	0.83 (0.75 – 0.91)	0.000	0.98 (0.89 – 1.08)	0.983
Educational attainment						
No formal education	1 (Reference)		1 (Reference)		1 (Reference)	
Primary education	0.89 (0.81 – 0.98)	0.022	0.85 (0.77 – 0.94)	0.002	1.36 (1.24 – 1.50)	<0.001
Secondary education	0.93 (0.84 – 1.03)	0.165	0.94 (0.85 – 1.04)	0.207	1.31 (1.19 – 1.45)	<0.001
Higher education	0.93 (0.79 – 1.09)	0.379	0.84 (0.71 – 0.99)	0.046	1.22 (1.04 – 1.42)	0.014
Residence						
Rural	0.96 (0.89 – 1.04)	0.362	1.08 (0.99 – 1.17)	0.065	0.96 (0.89 – 1.04)	0.331
Urban	1 (Reference)		1 (Reference)		1 (Reference)	
Ethnicity						
Igbo	1 (Reference)		1 (Reference)		1 (Reference)	
Yoruba	2.58 (2.26 – 2.96)	<0.001	0.81 (0.71 – 0.94)	0.005	3.29 (2.88 – 3.77)	<0.001
Hausa/ Fulani	1.16 (1.01 – 1.34)	0.039	1.05 (0.91 – 1.22)	0.499	1.26 (1.10 – 1.45)	<0.001
Minorities/Other	1.83 (1.64 – 2.06)	<0.001	1.08 (0.96 – 1.23)	0.205	1.32 (1.18 – 1.47)	<0.001

Religion						
Christianity	1 (Reference)		1 (Reference)		1 (Reference)	
Islam	0.81 (0.73 – 0.89)	<0.001	1.46 (1.32 – 1.60)	<0.001	0.71 (0.65 – 0.78)	<0.001
Traditionalism/Other	1.48 (0.95 – 2.32)	0.087	1.38 (0.93 – 2.06)	0.112	0.34 (0.22 – 0.51)	<0.001
Currently Working						
No	1 (Reference)		1 (Reference)		1 (Reference)	
Yes	1.00 (0.94 – 1.07)	0.943	0.97 (0.90 – 1.04)	0.330	1.00 (0.94 – 1.07)	0.905
ANC ^e Visits during pregnancy						
<4 visits	1 (Reference)		1 (Reference)		1 (Reference)	
≥4 visits	0.96 (0.90 – 1.03)	0.245	1.08 (1.01 – 1.16)	0.029	1.19 (1.11 – 1.27)	<0.001
Place of delivery						
Home	1 (Reference)		1 (Reference)		1 (Reference)	
Private hospital	0.92 (0.83 – 1.04)	0.173	1.03 (0.91 – 1.16)	0.635	0.97 (0.87 – 1.08)	0.601
Public hospital	1.10 (1.01 – 1.19)	0.029	1.06 (0.97 – 1.15)	0.205	1.31 (1.21 – 1.42)	<0.001
Last time Internet used						
Never	1 (Reference)		1 (Reference)		1 (Reference)	
Not recently	0.66 (0.43 – 1.02)	0.059	1.09 (0.69 – 1.72)	0.711	0.99 (0.64 – 1.54)	0.963
Recently	0.59 (0.46 – 0.74)	< 0.001	0.73 (0.55 – 0.97)	0.030	1.36 (1.06 – 1.76)	0.017
Frequency of Internet use						
Never	1 (Reference)		1 (Reference)		1 (Reference)	
Infrequent	1.41 (0.90 – 2.22)	0.321	0.66 (0.41 – 1.07)	0.089	1.32 (0.83 – 2.08)	0.241
Frequent	1.09 (0.69 – 1.72)	0.704	0.69 (0.43 – 1.12)	0.133	0.89 (0.56 – 1.40)	0.602

^a Please note that each column (early breastfeeding initiations, breastfeeding duration, and exclusive breastfeeding) depicts a separate model. ^bAll multivariate logistic models are adjusted by maternal age, marital status, wealth index (SES), education attainment, residence, ethnicity, religion, current working status, ANC visits during pregnancy, place of delivery, the last time the woman used the internet and the frequency of internet use. ^c95% Confidence Interval. ^dSES: Socioeconomic Status. ^eANC: Antenatal care.

ASSOCIATION BETWEEN BREASTFEEDING BEHAVIOURS AND SOCIODEMOGRAPHICS AND THE REST OF THE COVARIATES.

Compared to teenagers, young adults (OR=1.15, 95% CI=1.01-1.32) and mature adults (OR=1.25, 95% CI=1.08-1.44) had higher odds of initiating breastfeeding within first hour of birth. Middle class (OR=1.43, 95% CI=1.31-1.56) and rich (OR=1.68, 95% CI=1.52-1.85) women also had higher odds of early breastfeeding initiation compared to poor women. Yoruba women (OR=2.58, 95% CI=2.26-2.96) and Hausa/Fulani women (OR=1.16, 95% CI=1.01-1.34) had higher odds of early breastfeeding initiation compared to Igbo women. We found that Islamic women had 19% less odds (OR=0.81, 95% CI=0.73-0.89) of initiating early breastfeeding compared to Christians. Where those that gave birth in public hospitals had higher odds of early initiation (OR=1.10, 95% CI=1.01-1.19) compared to those that had home births, those who used the internet recently had less odds of early initiation (OR=0.59, 95% CI=0.46-0.74) compared to those that had never used the internet.

Young adults (OR=0.74, 95% CI=0.65-0.85) and mature adults (OR=0.50, 95% CI=0.43-0.58) had lower odds of breastfeeding for six months or more compared to teenagers; whereas, married women and those living with partners had higher odds (OR=1.25, 95% CI=1.00-1.56) of prolonged breastfeeding duration(s) compared to those who had never been married. Compared to poor women, rich women had lower odds (OR=0.83, 95% CI=0.75-0.91) of prolonged breastfeeding durations. Women with primary education (OR=0.85, 95% CI=0.77-0.94) and higher education (OR=0.84, 95% CI=0.71-0.99) had lower odds of prolonged breastfeeding duration compared to those with no formal education. Yoruba women had 19% lower odds of having a prolonged breastfeeding duration (OR=0.81, 95% CI=0.71-0.94) compared to Igbo women while Islamic women had 46% higher odds of breastfeeding for at least six months (OR=1.46, 95% CI=1.32-1.60) compared to Christian women. Those who made at least four ANC visits had higher odds (OR=1.08, 95% CI=1.01-1.16) of having prolonged breastfeeding duration compared to those who made less visits.

Compared to teenagers, young adults (OR=1.22, 95% CI=1.06-1.39) and mature adults (OR=1.17, 95% CI=1.02-1.35) had higher odds of exclusively breastfeeding. Conversely, middle class women (OR=0.89, 95% CI=0.82-0.97) compared to poor women, had lower odds of exclusively breastfeeding. Those with a higher education (OR=1.22, 95% CI=1.04-1.42) had 22% higher odds of exclusively breastfeeding compared to those with no formal education. Yoruba (OR=3.29, 95% CI=2.88-3.77), and Hausa/Fulani (OR=1.26, 95% CI=1.10-1.45) women both had higher odds of exclusive breastfeeding compared to Igbo women. Islamic women (OR=0.71, 95% CI=0.65-0.78) and traditionalists (OR=0.34, 95% CI=0.22-0.51) both had lower odds of exclusive breastfeeding compared to Christians while women who made at least four ANC visits (OR=1.19, 95% CI=1.11-1.27) had higher odds of exclusive breastfeeding compared to those who made less than four visits. Compared to women who had home births, those who gave birth

in public hospitals had higher odds of exclusive breastfeeding.

MODIFYING EFFECTS OF INTERNET USE AND PLACE OF DELIVERY ON ASSOCIATIONS.

Skin-to-skin contact was significantly associated with early breastfeeding initiation. But there was a stronger association among women who gave birth to their babies in private hospitals (OR=3.27, 95% CI=2.33-4.60) than in women who gave birth in public hospitals (OR=1.97, 95% CI=1.60-2.42) ($P<0.001$). The association between skin-to-skin contact and exclusive breastfeeding was not modified by the place of delivery. On the other hand, we found a stronger association between skin-to-skin contact and breastfeeding duration among women who gave birth in private hospitals (OR=1.56, 95% CI=1.14-2.15) than in women who gave birth in public hospitals (OR=0.98, 95% CI=0.80-1.22) ($P=0.008$). Neither the frequency nor the timing of internet use among Nigerian women modified the association between skin-to-skin contact and any of the three breastfeeding behaviours of interest.

DISCUSSION

This study assessed the association between skin-to-skin contact post-birth and breastfeeding behaviours (early breastfeeding initiation, breastfeeding duration and exclusive breastfeeding). Our findings suggest that exposure to skin-to-skin contact significantly reduced the odds of initiating breastfeeding within one hour of birth, significantly increased the odds of exclusively breastfeeding the newborn with breastmilk alone, but had no statistically significant association with breastfeeding for at least six months.

INTERPRETATION OF FINDINGS

Contrary to other studies,^{9,21} we found that skin-to-skin contact reduced the odds of early breastfeeding initiation in Nigerian women. Immediately after birth, babies in parts of Nigeria are bathed because vernix and the accompanying birth fluids/blood are believed to be 'dirty and unhygienic for the baby. It is believed that these birth fluids and vernix are likely to result in long-lasting body odour in the baby with time,²² if not quickly washed off at birth. A recent mixed-methods study found that new mothers in Northeast Nigeria refrained from early breastfeeding initiation until they had taken a shower or their labour pains had reduced—even when encouraged by their midwife or doctor to initiate early breastfeeding.²¹ These perceptions about birth fluids in relation to mother and child hygiene may explain the reduced odds of early breastfeeding initiation when skin-to-skin contact post-birth was experienced in our study. Most maternity wards in Nigerian hospitals are open plan and are shared by multiple new mothers at any given time, especially in public hospitals. This open plan nature and undefined hospital visiting hours can create a lack of privacy in the maternity ward. The presence of the new mother's relatives and visitors, as well as strangers visiting other new mothers in the maternity ward, can therefore be another deterrent to early breastfeeding initiation²¹

regardless of exposure to skin-to-skin contact. Whereas the increased odds of prolonged breastfeeding duration with skin-to-skin contact was not statistically significant in this study, our findings showed higher odds of exclusive breastfeeding among women who experienced skin-to-skin contact.^{1,23,24} The strong bonding and the maternal attachment/protectiveness triggered by the release of oxytocin during the skin-to-skin contact^{25,26} may explain the increased odds of exclusive breastfeeding in women who experienced skin-to-skin contact in this study.

We found that the odds of exclusive breastfeeding increased with age, which may be attributed to a better understanding of the benefits of breastfeeding for both mother and child in older women compared with teenage women. Older women are more likely to be more educated than teenagers, which may allow for more exposure to breastfeeding information. On the other hand, breastfeeding duration appeared to be inversely related to age in our study. Compared to teenage mothers, older mothers are more likely to have a job and more financial responsibilities, which may hinder the breastfeeding of their newborns for prolonged durations, as found in our study. They may worry about the effect of breastfeeding on their body shape and may have body image issues due to the general shift of body fat towards the middle torso, reduced elasticity and firmness of both skin and muscles,²⁷ resulting in reduced breastfeeding duration. Due to affordability or availability, reduced access to supplemental baby food (formula) means that baby formula may generally be perceived as synonymous with wealth in Nigeria. Previous studies show that social and emotional support systems/safety nets are wider among the rich when compared to the poor.²⁸ This may shift the primary caregiver role from the new mother to a nanny, grandmother, or other party. Thus, resulting in the introduction of formula feeding at an earlier stage among rich mothers.^{29,30} This may justify the reduced likelihood of exclusively breastfeeding or breastfeeding for at least six months, with increased wealth among the women in our study. Educated women are likely to have professional jobs and full-time employment³¹ either in the public or private sector, influencing the amount of time they can spend with their newborn before having to go back to work. In some states, new mothers (although entitled to fully paid maternity leave) may have any previously used annual leave deducted from their total maternity leave entitlement,³² leading to a need for early return to work³¹ due to reduced income and/or limited maternity leave availability. The fear of losing a job/the need to return to work soon after giving birth—as identified in other studies³³ may therefore explain the reduced breastfeeding duration found among the more educated women in our study, which is similar to other findings.³⁴ This result may also be explained by a reduced dependency on breastmilk among educated women due to their increased ability to afford baby formula—because of their ability to secure and keep professional and good-paying jobs compared to those with lower education levels who potentially end up with lower income jobs. Conversely, the increased likelihood of exclusive breastfeeding with increased education in our study^{35,36} was expected. Educated women are more likely to have higher health literacy than uneducated women.^{37,38} They are more likely to understand

the benefits of exclusive breastfeeding, more likely to ask pertinent questions where they do not fully understand, and more likely to act on the breastfeeding information they receive.³⁹ Our results which showed that, Hausa/Fulani women will initiate early breastfeeding and breastfeed for at least six months compared to Igbo women may be linked to cultural differences. It is common for fulani women to use a wet nurse in the first few days of birth, while waiting to produce their own milk.⁴⁰ The Islamic religion encourages breastfeeding for the first two years of life⁴¹ and may explain the increased odds of prolonged breastfeeding duration in moslem women compared to the Christian women in our study. This is in line with previous studies where Christians initiated breastfeeding but did not sustain it.⁴²

Antenatal care visits increase pregnant women's awareness of healthy breastfeeding behaviours/outcomes, potentially increasing their intention to breastfeed.⁴³ This may elucidate the increased likelihood of both prolonged breastfeeding duration and exclusive breastfeeding among Nigerian women who made at least four ANC visits in our study. According to Azito and Omenyo (2018), traditional birth attendants mostly receive their training from older or more experienced traditional birth attendants and have limited formal education to support their practices. Skilled delivery attendants that work in hospitals on the other hand, are formally trained, better understand the importance of early breastfeeding initiation,⁴⁴ and are consequently more likely to understand and adopt the Baby Friendly Health Initiative. This may explain the higher odds of early breastfeeding initiation among Nigerian women who gave birth in public hospitals versus their homes^{34,45} found in our study. Skilled delivery providers like private and public hospitals are also more likely to better understand the concept of skin-to-skin contact at birth and are less likely to be influenced by traditional practices and cultural norms when compared to traditional birth attendants. This is because the 'Baby-friendly hospital initiative'—although not fully implemented in all Nigerian hospitals—is more likely to be practiced during hospital births than home births. This may account for the modifying effect of place of delivery on the association between skin-to-skin contact and both breastfeeding initiation and breastfeeding duration, found in our study.

STRENGTHS AND LIMITATIONS OF THE STUDY

The very high response rate of 99%, the standardized data collection processes and national coverage of the DHS survey made comparison across populations possible and increased generalizability of our study. Despite this study's strengths, some limitations were identified. First, skin-to-skin duration is unclear and may have ranged from a few minutes to the recommended hour. The current recommendation is for the newborn to be in contact with their mother's bare chest for about one hour after birth⁴⁶ but there is no way to tell how long the newborn was on their mother's bare chest in our study since it did not consider the duration of the skin-to-skin contact observed. It is possible that they might not have been placed on their mother's bare chest long enough for the newborn to root around and find the breast. Future studies should assess the length of

time spent on the Nigerian mother's bare chest as a vital part of forming breastfeeding behaviours. This may affect the results²⁴ and we therefore recommend further studies using data with known skin-to-skin contact duration, in order to corroborate our results. Second, cross-sectional DHS data limited our ability to establish causality. Also, the retrospective self-reporting on skin-to-skin contact and breastfeeding behaviours may have resulted in recall bias. Third, the face-to-face method of data collection may have increased the risk of social desirability bias since the women may have identified more with the breastfeeding behaviours that they perceived as the healthier option, rather than with their actual breastfeeding experience(s). Fourth, the type of internet use was not specified in this study and therefore could have ranged from randomly surfing the web to the targeted use of social media platforms like Facebook, Instagram, or Twitter as information sources. Therefore, we cannot categorically say how much actual skin-to-skin information the women were exposed to on the internet, or even if they were exposed to skin-to-skin contact (mis)information. Further research assessing targeted skin-to-skin contact (mis)information on the internet/social media and breastfeeding behaviour is recommended.

CONCLUSIONS

Skin-to-skin contact after birth is inversely associated with early breastfeeding initiation and directly associated with exclusive breastfeeding in Nigerian women. This study highlights the need for increased/improved skin-to-skin contact practices in Nigerian hospitals through low-cost health education interventions as well as infant feeding policy interventions and implementation in hospitals. Health education programs to train skilled-delivery health-care providers, incorporate skin-to-skin contact practices into hospital birthing routines in the delivery wards, and readjust/rearrange some hospital procedures/protocols that interfere with optimal skin-to-skin contact at birth—except in the presence of compelling medical indications—are recommended. However, since more than half the population had home births and may not benefit from 'health provider targeted interventions', targeted community interventions aimed at pregnant women, traditional birth-attendants as well as faith-based interventions targeting religious clergy may help raise awareness and promote skin-to-skin contact practice among the uneducated, and poor populations in Nigeria. In addition, targeting educated and wealthy populations with role model interventions that make skin-to-skin contact and healthier breastfeeding behaviours trendy may help increase social desirability around skin-to-skin

contact, resulting in healthier breastfeeding behaviours overall.

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AUTHORSHIP CONTRIBUTIONS

CUO conceptualized and designed the study, managed and analyzed the data, interpreted the results, and drafted the manuscript under supervision. MPM supervised the entire study, substantially contributed to designing the study and interpreting the results, and critically reviewed the manuscript for important intellectual content. OAO carried out an extensive literature search, substantially contributed to the literature review, the interpretation of findings, and to the drafting of the manuscript. APM critically reviewed the study design, the statistical analyses used, and critically revised the manuscript for important intellectual content. All authors read and approved the final version of the manuscript for publication.

COMPETING INTERESTS

The authors completed the Unified Competing Interest form at <http://www.icmje.org/disclosure-of-interest/> (available upon request from the corresponding author) and declare no conflicts of interest.

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