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# Prevalence and Determinants of Exclusive Breastfeeding among Infants after Discharge from a Neonatal Unit in South-South Nigeria

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Author TA led the conceptualization and design of the study, performed the statistical analysis, and took the lead in drafting the manuscript. Authors BUE, RPM and ELO provided supervision throughout the research process, offering critical insights and revisions to both the protocol and manuscript. Data collection was carried out by all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

**Background:** Exclusive breastfeeding (EBF) is essential for infant health, but global rates remain below the WHO's 70% target. Neonatal unit admissions can disrupt EBF, yet little is known about EBF rates among infants discharged from Special Care Baby Units (SCBU) in Nigeria. Therefore, this study aimed to determine the exclusive breastfeeding prevalence among infants aged 0-6 months on follow up after discharge from SCBU in a tertiary facility.
**Methods:** A descriptive cross-sectional study was conducted among 263 mother-infant pairs at the Federal Medical Centre Yenagoa (FMCY) from February 7th – May 22nd 2024 using a semi-

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structured, interviewer-administered questionnaire. Data collected included sociodemographic characteristics and exclusive breastfeeding status, antenatal and delivery history, indication for admission, duration on admission, and breastfeeding support at birth and during admission. Data were analyzed using SPSS version 26, employing bivariate and multivariate logistic regression to identify factors associated with EBF.

**Results:** The EBF prevalence was 40.3%. Significant factors in bivariate analysis included child's age (OR = 0.41, p = 0.012), mode of delivery (OR = 1.82, p = 0.035), place of delivery (OR = 2.15, p = 0.022), gestational age (OR = 2.36, p = 0.014), pregnancy/birth complications (OR = 0.56, p = 0.047), prematurity/low birth weight (OR = 0.52, p = 0.040), early breastfeeding initiation (OR = 2.78, p = 0.006), skin-to-skin contact (OR = 2.04, p = 0.033), and health worker support (OR = 2.27, p = 0.019). In multivariate analysis, only child's age (OR = 0.37, p = 0.008) and skin-to-skin contact (OR = 0.49, p = 0.048) remained significant.

**Conclusion:** Exclusive breastfeeding rates among infants discharged from SCBU at FMCY are below optimal levels. Enhancing early skin-to-skin contact, and providing targeted breastfeeding support, especially for preterm and low-birth-weight infants, are crucial to improving EBF rates and meeting WHO targets.

*Keywords: Exclusive breastfeeding; neonatal follow-up; special care baby unit (SCBU); determinants of breastfeeding.*

## 1. INTRODUCTION

Exclusive breastfeeding, as defined by the World Health Organization (WHO), involves providing only breast milk to infants during the first six months of life (WHO, 2023). This practice is associated with a myriad of benefits, including optimal newborn growth, enhanced bonding and sensory development, protection against infections, and acting as a natural form of contraception for mothers (WHO, 2023). Despite these acknowledged advantages, global exclusive breastfeeding rates currently fall short of the WHO's 2030 target of 70%, standing at 48% (WHO, 2023, Russell, 2023). This disparity persists across various income brackets and poses a substantial public health challenge (WHO, 2023, Russell, 2023).

One significant contributing factor to the suboptimal exclusive breastfeeding rates is the occurrence of neonatal hospital admissions (Lande, et al., 2020, Wang & He, 2022, Martínez-Vázquez, et al., 2022, Jones, et al., 2023, Sokou, et al., 2022, Jiang & Jiang, 2022). Such admissions often result in the separation of mothers and infants, leading to heightened maternal stress, anxiety, and in some cases, depression (Lande, et al., 2020, Wang & He, 2022, Martínez-Vázquez, et al., 2022, Jones, et al., 2023, Sokou, et al., 2022, Jiang & Jiang, 2022). Additionally, the hospital environment may lack the essential elements of a baby-friendly facility, thereby compromising breastfeeding support (Lande, et al., 2020, Wang & He, 2022, Martínez-Vázquez, et al., 2022, Jones, et al., 2023, Sokou, et al., 2022, Jiang & Jiang, 2022, Abdirahman, et al., 2024).

Remarkably, there are not many studies looking at exclusive breastfeeding rates among newborns who have been discharged from the hospital, especially in our region. This study is one of the first to explore this at our center, the Federal Medical Centre, Yenagoa (FMCY), which is the main tertiary health facility in the state.

This study aimed to find out the rate of exclusive breastfeeding and the factors that affect it among infants who were admitted to and later discharged from the Special Care Baby Unit (SCBU) at FMCY. The findings will help identify important areas that need attention or policy changes. The findings will be useful for policymakers, healthcare workers, and mothers, helping to improve exclusive breastfeeding practices and the overall health of babies after they leave the hospital.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The study was conducted at the neonatal clinic of the Federal Medical Centre, Yenagoa (FMCY), a 425-bedded tertiary health facility serving Bayelsa State and neighboring regions (Yenagoa, 2017). The neonatal clinic operates every Wednesday from 9 am to 4 pm, under the supervision of two consultant neonatologists, a senior registrar, and a house officer. It provides follow-up care for infants discharged from the Special Care Baby Unit (SCBU) with a maximum

follow-up duration of two years. On average, the clinic attends to 15-20 infants per clinic day.

### 2.2 Study Design

It was a descriptive analytical hospital-based cross-sectional study.

### 2.3 Sample Size Estimation

The sample size was determined using the formula for prevalence studies involving one group (Bolarinwa, 2020). Based on a prevalence of exclusive breastfeeding (19%) from a previous study Jiang & Jiang, 2022, with a 95% confidence level, 5% precision, and a 10% adjustment for non-response rate, a total of 263 mother/infant pairs were recruited.

### 2.4 Study participants

Mothers and infants aged 0-6 months on neonatal clinic follow up

### 2.5 Inclusion/Exclusion Criteria

Eligible participants were infants aged 0 to 6 months, attending neonatal clinic follow-up after SCBU discharge, with parental consent. Exclusions included infants with absolute contraindications to breastfeeding, and those with parental refusal of consent.

### 2.6 Sampling Technique

Consecutive recruitment of eligible participants presenting to the neonatal clinic was done.

### 2.7 Data Collection

A semi-structured, interviewer-administered questionnaire, developed from a comprehensive literature review, was used. The questionnaire comprised three sections: Sociodemographic characteristics and exclusive breastfeeding status (Section 1), Antenatal and delivery history (Section 2), Indication for admission, duration on admission, and breastfeeding support at birth and during admission (Section 3). Socioeconomic status was determined using the revised classification scheme by Ibadin and Akpede (2021). Data was collected over a period of four months (February 7$^{th}$ – May 22$^{nd}$ 2024).

### 2.8 Data Analysis

Data were analyzed using the Statistical Package for Social Science (SPSS) version 26. Categorical variables were summarized using frequencies and percentages. Associations between exclusive breastfeeding and various factors, including sociodemographic, antenatal, delivery, and admission history, were tested using Chi-square/Fisher's exact tests and crude odds ratios via bivariate logistic regression. Factors that showed significant associations at the bivariate level, along with gender, were included in a multivariate logistic regression model to identify significant predictors. A p-value of less than 0.05 was considered statistically significant.

## 3. RESULTS

### 3.1 Sociodemographic Characteristics of Study Subjects

As shown in Table 1, the study population consisted predominantly of mothers aged 25-34 years (54.4%) and mothers with tertiary education (52.9%). Similarly, a majority of fathers had tertiary education (54.8%). Most families belonged to the middle socioeconomic status group (51.3%). The majority of participants were of Ijaw ethnicity (50.6%) and Christian religion (98.9%). Most resided in urban areas (93.2%). Most children were less than 30 days old (68.1%), and there was a slightly higher proportion of female children (55.1%). Nearly half of the children had 1-2 siblings (48.3%), and the majority were of birth order less than 4 (78.3%).

### 3.2 Antenatal and Delivery History of Study Subjects

The antenatal and delivery history of the study population showed that the majority of conceptions were natural (90.9%) [Table 2]. Most mothers received antenatal care (92.0%), with a high regularity of attendance (91.8%). Among those who attended antenatal care, 59.4% went to tertiary facilities. Most mothers were multipara (71.9%). The most common mode of delivery was normal vaginal delivery (63.1%), followed by emergency C-section (20.2%) and elective C-section (16.7%). The majority of deliveries were at term (66.5%), with preterm deliveries accounting for 31.2%. Among preterm births, late preterm was the most common (40.2%) [Table 2].

**Table 1. Sociodemographic characteristics of study subjects**

| Variable | Frequency | Percent |
|---|---|---|
| **Mothers age** | | |
| 18-24 | 36 | 13.7 |
| 25-34 | 143 | 54.4 |
| 35 and older | 84 | 31.9 |
| **Mothers education** | | |
| No formal education | 11 | 4.2 |
| Primary | 22 | 8.4 |
| Secondary | 91 | 34.6 |
| Tertiary | 139 | 52.9 |
| **Fathers level of education** | | |
| No formal education | 17 | 6.5 |
| Primary | 26 | 9.9 |
| Secondary | 76 | 28.9 |
| Tertiary | 144 | 54.8 |
| **Socioeconomic status** | | |
| Low | 94 | 35.7 |
| Middle | 135 | 51.3 |
| High | 34 | 12.9 |
| **Ethnicity** | | |
| Ijaw | 133 | 50.6 |
| Igbo | 95 | 36.1 |
| Yoruba | 10 | 3.8 |
| Others | 25 | 9.5 |
| **Religion** | | |
| Christianity | 260 | 98.9 |
| Islam | 3 | 1.1 |
| Others | 0 | 0.0 |
| **Place of residence** | | |
| Urban | 245 | 93.2 |
| Rural | 18 | 6.8 |
| **Child age (days)** | | |
| <30 | 179 | 68.1 |
| 30-90 | 65 | 24.7 |
| >90 | 19 | 7.2 |
| **Child gender** | | |
| Male | 118 | 44.9 |
| Female | 145 | 55.1 |
| **Number of siblings** | | |
| None | 74 | 28.1 |
| 1-2 | 127 | 48.3 |
| 3 or more | 62 | 23.6 |
| **Birth order** | | |
| <4 | 206 | 78.3 |
| 4 and more | 57 | 21.7 |

In terms of birth weight, 48.7% of infants had normal birth weight, while 16.0% were low birth weight (LBW). There were 5.3% extreme LBW, 9.9% very LBW, and 10.3% macrosomia cases. Birth complications were reported in 31.6% of pregnancies. Most deliveries did not involve anesthesia (60.8%), but 37.6% used regional anesthesia. Multiple births occurred in 6.5% of cases (Table 2).

### 3.3 Admission and Breastfeeding History of Study Subjects

The admission and breastfeeding history of the study population indicated that the most common reasons for admission were neonatal jaundice (NNJ) (62.0%), prematurity/low birth weight (LBW) (29.3%), and neonatal sepsis (NNS) (24.7%) [Table 3]. Other reasons included

**Table 2. Antenatal and delivery history of study subjects**

| Variable | Frequency | Percent |
|---|---|---|
| **Type of conception** | | |
| Natural | 239 | 90.9 |
| Artificial | 24 | 9.1 |
| **Antenatal care** | | |
| Yes | 242 | 92.0 |
| No | 21 | 8.0 |
| **Regularity of ANC (N=244)** | | |
| Regular | 224 | 91.8 |
| Not regular | 20 | 8.2 |
| **Place of ANC attendance (N=244)** | | |
| Primary | 38 | 15.6 |
| Secondary | 61 | 25.0 |
| Tertiary | 145 | 59.4 |
| **Parity** | | |
| Primipara | 74 | 28.1 |
| Multipara | 189 | 71.9 |
| **Mode of delivery** | | |
| Normal vaginal | 166 | 63.1 |
| Elective C/S | 44 | 16.7 |
| Emergency C/S | 53 | 20.2 |
| **Gestational age at delivery** | | |
| Preterm | 82 | 31.2 |
| Term | 175 | 66.5 |
| Post term | 6 | 2.3 |
| **Degree of prematurity (N=82)** | | |
| Extreme | 12 | 14.6 |
| Very preterm | 27 | 32.9 |
| Moderate preterm | 10 | 12.2 |
| Late preterm | 33 | 40.2 |
| **Birth weight** | | |
| Extreme LBW | 14 | 5.3 |
| VLBW | 26 | 9.9 |
| LBW | 42 | 16.0 |
| Normal | 128 | 48.7 |
| Macrosomia | 27 | 10.3 |
| Unknown | 26 | 9.9 |
| **Pregnancy/birth complications** | | |
| Yes | 83 | 31.6 |
| No | 180 | 68.4 |
| **Anaesthesia** | | |
| None | 160 | 60.8 |
| General | 4 | 1.5 |
| Regional | 99 | 37.6 |
| **Multiple birth** | | |
| Yes | 17 | 6.5 |
| No | 246 | 93.5 |

perinatal asphyxia (14.8%) and respiratory distress syndrome (RDS) (15.2%). A higher proportion of infants were out born (58.2%) compared to inborn (41.8%).

Regarding breastfeeding practices, only 40.3% of mothers practiced exclusive breastfeeding, while 59.7% did not. Skin-to-skin contact at birth was practiced by 32.7% of mothers, and early initiation of breastfeeding was reported by 37.6%. Maintenance of breastfeeding while on admission was observed in 36.1% of cases. Breastfeeding support from health workers was provided to 39.5% of mothers.

**Table 3. Admission and breastfeeding history of study subjects**

| Variable | Frequency | Percent |
|---|---|---|
| **Indication for admission** | | |
| Perinatal asphyxia | 39 | 14.8 |
| Prematurity/LBW | 77 | 29.3 |
| NNS | 65 | 24.7 |
| NNJ | 163 | 62.0 |
| **Inborn/Outborn segment** | | |
| Inborn | 110 | 41.8 |
| Outborn | 153 | 58.2 |
| **Exclusive breastfeeding** | | |
| Yes | 106 | 40.3 |
| No | 157 | 59.7 |
| **Skin to skin contact at birth** | | |
| Yes | 97 | 36.9 |
| No | 166 | 63.1 |
| **Early initiation of breastfeeding at birth** | | |
| Yes | 99 | 37.6 |
| No | 164 | 62.4 |
| **Maintenance of breastfeeding while on admission** | | |
| Yes | 95 | 36.1 |
| No | 168 | 63.9 |
| **Breastfeeding support by health workers** | | |
| Yes | 104 | 39.5 |
| No | 159 | 60.5 |
| **Duration of admission (days)** | | |
| <7 | 82 | 31.2 |
| 7-14 | 126 | 47.9 |
| >14 | 55 | 20.9 |

The duration of admission varied, with 31.2% of infants admitted for less than 7 days, 47.9% for 7-14 days, and 20.9% for more than 14 days [Table 3].

### 3.4 Sociodemographic Factors and Prevalence of Exclusive Breastfeeding in Study Subjects

Mothers aged 25-34 were more likely to exclusively breastfeed compared to those aged 18-24 (44.8% vs. 33.3%), though this was not statistically significant (OR = 1.62, 95% CI: 0.75-3.49, p = 0.218) [Table 4]. Similarly, mothers aged 35 and older had a comparable likelihood of exclusive breastfeeding (35.7% vs. 33.3%, OR = 1.11, 95% CI: 0.49-2.53, p = 0.802). Educational level, socioeconomic status, ethnicity, religion, and place of residence did not significantly impact exclusive breastfeeding rates. However, children under 30 days were significantly more likely to be exclusively breastfed compared to those aged 30-90 days (45.8% vs. 23.1%, OR = 0.35, 95% CI: 0.19-0.68, p = 0.002), but not significantly different from those over 90 days (45.8% vs 47.4%, OR = 1.06, 95% CI: 0.41-2.74, p = 0.897). Child's gender did not significantly affect exclusive breastfeeding rates (Table 4).

### 3.5 Antenatal and Delivery History and the Prevalence of Exclusive Breastfeeding in Study Subjects

Mothers who conceived naturally were more likely to exclusively breastfeed compared to those with artificial conception (OR 0.27, 95% CI: 0.09-0.81, p = 0.020) [Table 5]. Additionally, primiparous mothers were less likely to exclusively breastfeed compared to multiparous mothers (OR 2.06, 95% CI: 1.15-3.69, p = 0.015). Furthermore, the mode of delivery significantly impacted breastfeeding rates;

mothers who had an emergency C-section were less likely to exclusively breastfeed compared to those who had a normal vaginal delivery (OR 0.38, 95% CI: 0.19-0.77, p = 0.007).

**Table 4. Sociodemographic factors and prevalence of exclusive breastfeeding in study subjects**

| Variable | Exclusive breastfeeding | | Statistics (pvalue) | Crude odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| | Yes N (%) | No N (%) | | | |
| **Mothers age** | | | | | |
| 18-24 | 12 (33.3) | 24 (66.7) | 2.64[a] (0.267) | 1 | |
| 25-34 | 64 (44.8) | 79 (55.2) | | 1.62 (0.75-3.49) | 0.218 |
| 35 and older | 30 (35.7) | 54 (64.3) | | 1.11 (0.49-2.53) | 0.802 |
| **Mothers level of education** | | | | | |
| No formal education | 5 (45.5) | 6 (54.5) | 1.11[a] (0.774) | 1 | |
| Primary | 9 (40.9) | 13 (59.1) | | 0.83 (0.19-3.58 | 0.803 |
| Secondary | 40 (44.0) | 51 (56.0) | | 0.94 (0.27-3.31) | 0.925 |
| Tertiary | 52 (37.4) | 87 (62.6) | | 0.72 (0.21-2.47) | 0.598 |
| **Socioeconomic class** | | | | | |
| Low | 41 (43.6) | 53 (56.4) | 2.08[a] (0.353) | 1 | |
| Middle | 55 (40.7) | 80 (59.3) | | 0.89 (0.52-1.51) | 0.664 |
| High | 10 (29.4) | 24 (70.6) | | 0.54 (0.23-1.25) | 0.150 |
| **Ethnicity** | | | | | |
| Ijaw | 59 (44.4) | 74 (55.6) | 2.67[b] (0.446) | 1 | |
| Igbo | 36 (37.9) | 59 (62.1) | | 0.76 (0.45-1.31) | 0.329 |
| Yoruba | 4 (40.0) | 6 (60.0) | | 0.84 (0.22-3.10) | 0.789 |
| Others | 7 (28.0) | 18 (72.0) | | 0.49 (0.19-1.25) | 0.133 |
| **Religion** | | | | | |
| Christianity | 104 (40.0) | 156 (60.0) | 0.85[b] (0.567) | 1 | |
| Islam | 2 (66.7) | 1 (33.3) | | 3.00 (0.27-33.5) | 0.372 |
| **Place of residence** | | | | | |
| Urban | 99 (40.4) | 146 (59.6) | 0.01[a] (0.899) | 1 | |
| Rural | 7 (38.9) | 11 (61.1) | | 0.94 (0.35-2.50) | 0.899 |
| **Childs age (days)** | | | | | |
| <30 | 82 (45.8) | 97 (54.2) | 10.16[a] (0.006)* | 1 | |
| 30-90 | 15 (23.1) | 50 (76.9) | | 0.35 (0.19-0.68) | 0.002* |
| >90 | 9 (47.4) | 10 (52.6) | | 1.06 (0.41-2.74) | 0.897 |
| **Child gender** | | | | | |
| Male | 51 (43.2) | 67 (56.8) | 0.76[a] (0.384) | 1 | |
| Female | 55 (37.9) | 90 (62.1) | | 0.80 (0.49-1.32) | 0.385 |
| **Number of siblings** | | | | | |
| None | 52 (70.3) | 22 (29.7) | 5.97 (0.051) | 1 | |
| 1-2 | 74 (58.3) | 53 (41.7) | | 1.69 (0.92-3.12) | 0.091 |
| 3 or more | 31 (50.0) | 31 (50.0) | | 2.36 (1.17-4.78) | 0.017* |
| **Birth order** | | | | | |
| <4 | 128 (62.4) | 77 (37.6) | 2.91 (0.088) | 1 | |
| 4 and more | 29 (50.0) | 29 (50.0) | | 1.66 (0.92-2.99) | 0.090 |

*[a] is chi-square, [b] is Fisher's exact test, * is statistically significant*

**Table 5. Antenatal and delivery history and the prevalence of exclusive breastfeeding in study subjects**

| Variable | Exclusive breastfeeding | | Statistics (pvalue) | Crude odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| | Yes N (%) | No N (%) | | | |
| **Type of conception** | | | | | |
| Natural | 102 (42.7) | 137 (57.3) | 6.13[b] (0.013)* | 1 | |
| Artificial | 4 (16.7) | 20 (83.3) | | 0.27 (0.09-0.81) | 0.020* |
| **Antenatal care** | | | | | |
| Yes | 97 (40.1) | 145 (59.9) | 0.06[a] (0.804) | 1 | |
| No | 9 (42.9) | 12 (57.1) | | 1.12 (0.45-2.76) | 0.804 |
| **Regularity of ANC (N=244)** | | | | | |
| Regular | 86 (38.4) | 138 (61.6) | 2.11[a] (0.150) | 1 | |
| Not regular | 11 (55.0) | 9 (45.0) | | 1.96 (0.78-4.93) | 0.152 |
| **Place of ANC attendance (N=244)** | | | | | |
| Primary | 19 (50.0) | 19 (50.0) | 2.79[a] (0.248) | 1 | |
| Secondary | 26 (42.6) | 35 (57.4) | | 0.74 (0.33-1.68) | 0.474 |
| Tertiary | 52 (35.9) | 93 (64.1) | | 0.56 (0.27-1.15) | 0.114 |
| **Parity** | | | | | |
| Primipara | 21 (28.4) | 53 (71.6) | 6.08[a] (0.014)* | 1 | |
| Multipara | 85 (45.0) | 104 (55.0) | | 2.06 (1.15-3.69) | 0.015* |
| **Mode of delivery** | | | | | |
| Normal vaginal | 76 (45.8) | 90 (54.2) | 7.60[a] (0.022)* | 1 | |
| Elective C/S | 17 (38.6) | 27 (61.4) | | 0.75 (0.38-1.47) | 0.397 |
| Emergency C/S | 13 (24.5) | 40 (75.5) | | 0.38 (0.19-0.77) | 0.007* |
| **Place of delivery** | | | | | |
| Home | 7 (70.0) | 3 (30.0) | 6.83[b] (0.142) | 1 | |
| TBA | 9 (52.9) | 8 (47.1) | | 0.48 (0.09-2.52) | 0.387 |
| Primary | 9 (42.9) | 12 (57.1) | | 0.32 (0.65-1.60) | 0.166 |
| Secondary | 30 (43.5) | 39 (56.5) | | 0.33 (0.08-1.38) | 0.129 |
| Tertiary | 51(34.9) | 95 (65.1) | | 0.23 (0.06-0.93) | 0.039* |
| **Gestational age at delivery** | | | | | |
| Preterm | 25 (30.5) | 57 (69.5) | 6.60[b] (0.027)* | 1 | |
| Term | 80 (45.7) | 95 (54.3) | | 1.92 (1.10-3.35) | 0.022* |
| Post term | 1 (16.7) | 5 (83.3) | | 0.46 (0.05-4.11) | 0.484 |
| **Degree of prematurity (N=82)** | | | | | |
| Extreme preterm | 3 (25.0) | 9 (75.0) | 1.13[b] (0.778) | 1 | |
| Very preterm | 10 (37.0) | 17 (67.0) | | 1.76 (0.38-8.09) | 0.465 |
| Moderate preterm | 2 (20.0) | 8 (80.0) | | 0.75 (0.09-5.69) | 0.781 |
| Late preterm | 10 (30.3) | 23 (69.7) | | 1.30 (0.29-5.86) | 0.729 |
| **Birth weight** | | | | | |
| Extreme LBW | 4 (28.6) | 10 (71.4) | 9.30[b] (0.095) | 1 | |
| VLBW | 9 (34.6) | 17 (65.4) | | 1.32 (0.32-5.44) | 0.697 |
| LBW | 12 (28.6) | 30 (71.4) | | 1.00 (0.26-3.81) | 1.000 |
| Normal | 56 (43.8) | 72 (56.2) | | 1.94 (0.58-6.53) | 0.282 |

| Variable | Exclusive breastfeeding | | Statistics (pvalue) | Crude odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| Macrosomia | 9 (33.3) | 18 (66.7) | | 1.25 (0.31-5.11) | 0.756 |
| Unknown | 16 (61.5) | 10 (38.5) | | 4.00 (0.98-16.27) | 0.053 |
| **Pregnancy/birth complications** | | | | | |
| Yes | 24 (28.9) | 59 (71.1) | 6.54[a] (0.011)* | 1 | |
| No | 82 (45.6) | 98 (54.4) | | 2.06 (1.18-3.59) | 0.011* |
| **Anaesthesia** | | | | | |
| None | 73 (45.6) | 87 (54.4) | 6.19[b] (0.031)* | 1 | |
| General | 0 (0.0) | 4 (100.0) | | - | - |
| Regional | 33 (33.3) | 66 (66.7) | | 0.60 (0.35-1.00) | 0.051 |
| **Multiple birth** | | | | | |
| Yes | 3 (17.6) | 14 (82.4) | 3.88[b] (0.071) | 1 | |
| No | 103 (41.9) | 143 (58.1) | | 3.36 (0.94-12.00) | 0.062 |

*[a] is chi-square, [b] is Fisher's exact test, * is statistically significant*

Moreover, mothers who delivered in tertiary care facilities were less likely to exclusively breastfeed compared to those who delivered at home (OR 0.23, 95% CI: 0.06-0.93, p = 0.039). In terms of gestational age, term infants were more likely to be exclusively breastfed compared to preterm infants (OR 1.92, 95% CI: 1.10-3.35, p = 0.022). Additionally, mothers without pregnancy or birth complications were more likely to exclusively breastfeed compared to those with complications (OR 2.06, 95% CI: 1.18-3.59, p = 0.011).

Furthermore, mothers who did not use any anaesthesia during delivery were more likely to exclusively breastfeed compared to those who had regional anaesthesia (OR 0.60, 95% CI: 0.35-1.00, p = 0.051). Finally, mothers with single births were more likely to exclusively breastfeed compared to those with multiple births (OR 3.36, 95% CI: 0.94-12.00, p = 0.062) [Table 5].

### 3.6 Admission and Breastfeeding History and the Prevalence of Exclusive Breastfeeding in Study Subjects

Mothers with infants who were premature or had low birth weight were significantly less likely to exclusively breastfeed compared to those whose infants were not premature or low birth weight (OR 1.89, 95% CI: 1.07-3.34, p = 0.028) [Table 6]. Additionally, mothers who initiated breastfeeding early were significantly more likely to exclusively breastfeed compared to those who did not initiate breastfeeding early (OR 0.29, 95% CI: 0.17-0.49, p < 0.001). Furthermore, mothers who had skin-to-skin contact at birth were significantly more likely to exclusively breastfeed compared to those who did not have skin-to-skin contact (OR 0.32, 95% CI: 0.19-0.53, p < 0.001). Moreover, mothers who maintained exclusive breastfeeding practices were significantly more likely to exclusively breastfeed compared to those who did not maintain these practices (OR 0.34, 95% CI: 0.20-0.57, p < 0.001). Finally, mothers who received breastfeeding support from health workers were significantly more likely to exclusively breastfeed compared to those who did not receive such support (OR 0.29, 95% CI: 0.16-0.47, p < 0.001) [Table 6].

### 3.7 Multivariate Analysis of Factors Associated with Exclusive Breastfeeding in Study Subjects

After conducting a multivariate logistic regression analysis, it was found that only child's age and skin-to-skin contact at birth were significantly associated with exclusive breastfeeding. Specifically, children aged 30-90 days were significantly less likely to be exclusively breastfed compared to those under 30 days (OR 0.37, 95% CI: 0.17-0.76, p = 0.008) [Table 7]. Additionally, the absence of skin-to-skin contact at birth significantly reduced the likelihood of exclusive breastfeeding (OR 0.49, 95% CI: 0.25-0.99, p = 0.048) [Table 7]. Other factors, including child gender, number of siblings, type of conception, parity, place and mode of delivery, gestational age, pregnancy or birth complications, anesthesia use, prematurity or low birth weight, early initiation of breastfeeding, maintenance of exclusive breastfeeding, and breastfeeding support by health workers, were not significantly associated with exclusive breastfeeding in the multivariate model.

**Table 6. Admission and breastfeeding history and the prevalence of exclusive breastfeeding in study subjects**

| Variables | Exclusive breastfeeding | | Statistics (pvalue) | Crude odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| | Yes N (%) | No N (%) | | | |
| **Perinatal asphyxia** | | | | | |
| Yes | 11 (28.2) | 28 (71.8) | 2.79[a] (0.095) | 1 | |
| No | 95 (42.4) | 129 (57.6) | | 1.87 (0.89-3.95) | 0.099 |
| **Prematurity/LBW** | | | | | |
| Yes | 23 (29.9) | 54 (70.1) | 4.93[a] (0.026)* | 1 | |
| No | 83 (44.6) | 103 (55.4) | | 1.89 (1.07-3.34) | 0.028* |
| **Neonatal Sepsis** | | | | | |
| Yes | 28 (43.1) | 37 (56.9) | 0.28[a] (0.599) | 1 | |
| No | 78 (39.4) | 120 (60.6) | | 0.86 (0.49-1.51) | 0.600 |
| **Neonatal Jaundice** | | | | | |
| Yes | 72 (44.2) | 91 (55.8) | 2.66[a] (0.103) | 1 | |
| No | 34 (34.0) | 66 (66.0) | | 0.65 (0.39-1.09) | 0.103 |
| **Inborn/Outborn** | | | | | |
| Inborn | 37 (33.6) | 73 (66.4) | 3.49[a] (0.062) | 1 | |
| Outborn | 69 (45.1) | 84 (54.9) | | 1.62 (0.97-2.69) | 0.062 |
| **Early initiation of breastfeeding** | | | | | |
| Yes | 58 (58.6) | 41 (41.4) | 22.05[a] (<0.001)* | 1 | |
| No | 48 (29.3) | 116 (70.7) | | 0.29 (0.17-0.49) | <0.001* |
| **Skin to skin contact at birth** | | | | | |
| Yes | 41 (42.3) | 56 (57.7) | 19.4[a] (0.002)* | 1 | |
| No | 116 (69.9) | 50 (30.1) | | 0.32 (0.19-0.53) | <0.001* |
| **Maintenance of exclusive breastfeeding** | | | | | |
| Yes | 54 (56.8) | 41 (43.2) | 16.91[a] (<0.001)* | 1 | |
| No | 52 (31.0) | 116 (69.0) | | 0.34 (0.20-0.57) | <0.001* |
| **Breastfeeding support by health workers** | | | | | |
| Yes | 61 (58.7) | 43 (41.3) | 24.07[a] (<0.001)* | 1 | |
| No | 45 (28.3) | 114 (71.7) | | 0.29 (0.16-0.47) | <0.001* |

| Variables | Exclusive breastfeeding | | Statistics (pvalue) | Crude odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| | Yes N (%) | No N (%) | | | |
| **Duration of admission (days)** | | | | | |
| <7 | 37 (45.1) | 45 (54.9) | 1.57[a] (0.456) | 1 | |
| 7-14 | 50 (39.7) | 76 (60.3) | | 0.80 (0.46-1.40) | 0.437 |
| >14 | 19 (34.5) | 36 (65.5) | | 0.64 (0.32-1.30) | 0.218 |

*[a] is chi-square, * is statistically significant*

**Table 7. Multivariate analysis of factors associated with exclusive breastfeeding in study subjects**

| Variables | Exclusive breastfeeding | | B-coefficient | Adjusted odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| | Yes N (%) | No N (%) | | | |
| **Childs age (days)** | | | | | |
| <30 | 82 (45.8) | 97 (54.2) | | 1 | |
| 30-90 | 15 (23.1) | 50 (76.9) | -1.01 | 0.37 (0.17-0.76) | 0.008* |
| >90 | 9 (47.4) | 10 (52.6) | 0.05 | 1.05 (0.37-3.04) | 0.921 |
| **Child gender** | | | | | |
| Male | 51 (43.2) | 67 (56.8) | | 1 | |
| Female | 55 (37.9) | 90 (62.1) | -0.37 | 0.69 (0.39-1.23) | 0.209 |
| **Number of siblings** | | | | | |
| None | 52 (70.3) | 22 (29.7) | | 1 | |
| 1-2 | 74 (58.3) | 53 (41.7) | -0.10 | 0.90 (0.07-10.70) | 0.937 |
| 3 or more | 31 (50.0) | 31 (50.0) | 0.13 | 1.14 (0.09-14.18) | 0.917 |
| **Type of conception** | | | | | |
| Natural | 102 (42.7) | 137 (57.3) | | 1 | |
| Artificial | 4 (16.7) | 20 (83.3) | -0.95 | 0.39 (0.09-1.66) | 0.201 |
| **Parity** | | | | | |
| Primipara | 21 (28.4) | 53 (71.6) | | 1 | |
| Multipara | 85 (45.0) | 104 (55.0) | 1.05 | 2.87 (0.25-33.66) | 0.401 |
| **Place of delivery** | | | | | |
| Home | 7 (70.0) | 3 (30.0) | | 1 | |
| TBA | 9 (52.9) | 8 (47.1) | 0.15 | 1.16 (0.18-7.40) | 0.876 |

| Variables | Exclusive breastfeeding | | B-coefficient | Adjusted odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| | Yes N (%) | No N (%) | | | |
| Primary | 9 (42.9) | 12 (57.1) | -0.57 | 0.56 (0.09-3.47) | 0.536 |
| Secondary | 30 (43.5) | 39 (56.5) | -0.55 | 0.58 (0.12-2.81) | 0.496 |
| Tertiary | 51(34.9) | 95 (65.1) | -0.96 | 0.38 (0.08-1.90) | 0.241 |
| **Mode of delivery** | | | | | |
| Normal vaginal | 76 (45.8) | 90 (54.2) | | 1 | |
| Elective C/S | 17 (38.6) | 27 (61.4) | 0.48 | 1.62 (0.50-5.20) | 0.420 |
| Emergency C/S | 13 (24.5) | 40 (75.5) | -0.45 | 0.64 (0.18-2.22) | 0.480 |
| **Gestational age at delivery** | | | | | |
| Preterm | 25 (30.5) | 57 (69.5) | | 1 | |
| Term | 80 (45.7) | 95 (54.3) | -0.27 | 0.77 (0.77-7.64) | 0.820 |
| Post term | 1 (16.7) | 5 (83.3) | -1.63 | 0.19 (0.01-5.20) | 0.329 |
| **Pregnancy/birth complications** | | | | | |
| Yes | 24 (28.9) | 59 (71.1) | | 1 | |
| No | 82 (45.6) | 98 (54.4) | -0.13 | 0.88 (0.37-2.09) | 0.765 |
| **Anaesthesia** | | | | | |
| None | 73 (45.6) | 87 (54.4) | | 1 | |
| General | 0 (0.0) | 4 (100.0) | - | - | - |
| Regional | 33 (33.3) | 66 (66.7) | 0.20 | 1.22 (0.42-3.55) | 0.715 |
| **Prematurity/LBW** | | | | | |
| Yes | 23 (29.9) | 54 (70.1) | | 1 | |
| No | 83 (44.6) | 103 (55.4) | -0.05 | 0.95 (0.09-10.18) | 0.968 |
| **Early initiation of breastfeeding** | | | | | |
| Yes | 58 (58.6) | 41 (41.4) | | 1 | |
| No | 48 (29.3) | 116 (70.7) | -0.67 | 0.51 (0.22-1.20) | 0.123 |
| **Skin to skin contact at birth** | | | | | |
| Yes | 41 (42.3) | 56 (57.7) | | 1 | |
| No | 116 (69.9) | 50 (30.1) | -0.70 | 0.49 (0.25-0.99) | 0.048* |

| Variables | Exclusive breastfeeding | | B-coefficient | Adjusted odds ratio (95%CI) | pvalue |
|---|---|---|---|---|---|
| | Yes N (%) | No N (%) | | | |
| **Maintenance of exclusive breastfeeding** | | | | | |
| Yes | 54 (56.8) | 41 (43.2) | | 1 | |
| No | 52 (31.0) | 116 (69.0) | -0.27 | 0.76 (0.34-1.69) | 0.504 |
| **Breastfeeding support by health workers** | | | | | |
| Yes | 61 (58.7) | 43 (41.3) | | 1 | |
| No | 45 (28.3) | 114 (71.7) | -0.32 | 0.73 (0.32-1.66) | 0.448 |

** is statistically significant*

## 4. DISCUSSION

Exclusive breastfeeding (EBF) remains a cost-effective means of improving childhood health indices, especially in low- and middle-income countries (LMICs), where access to healthcare is limited. This study assessed the prevalence of EBF and its determinants among infants on follow-up after discharge from the Special Care Baby Unit (SCBU) of FMCY. Our findings revealed an EBF prevalence of 40.3%, which, while higher than the national average reported in the 2018 Nigeria Demographic Health Survey (NDHS) (NPC & ICF, 2019) (29%) and the 26.9% reported by Peterside et al., (2013) in Bayelsa State in 2013, is still below the World Health Organization's (WHO) global target of 70% by 2030 (WHO, 2023). The higher prevalence in our study may be attributed to its hospital-based nature, in contrast to the community surveys conducted in the NDHS and by Peterside et al., (2013). The reported prevalence is similar to the 46.1% found by Olasinde et al., (2021) in Ogbomoso, Southwestern Nigeria, and the 51.5% reported by Wang et al., (2022) in China, both of which were also hospital-based studies.

Our study found that infants under 30 days old were more likely to be exclusively breastfed than those aged 30-90 days. This reflects a common decline in EBF rates as infants age, a trend also observed by Wang et al., (2022) in China. This finding highlights the importance of interventions that promote sustained EBF, especially as infants grow older and the likelihood of introducing complementary foods increases.

Furthermore, natural conception was associated with higher EBF rates compared to artificial conception, potentially due to increased maternal confidence. However, this association was not supported by Lande et al. (2020) in Georgia, indicating that other sociodemographic factors may influence breastfeeding behaviors.

Another factor significantly associated with EBF was parity. Multiparous mothers were more likely to exclusively breastfeed compared to primiparous mothers. This could be due to the experience and confidence gained from previous breastfeeding attempts, which makes them more adept at overcoming challenges associated with breastfeeding (Wang & He, 2022, Martínez-Vázquez, et al., 2022). Previous studies, such as those by Wang et al., (2022) in China and Martinez-Vasquez et al., (2022) in Spain, have similarly found that prior breastfeeding experience positively influences EBF. This underscores the importance of targeted breastfeeding education and support for first-time mothers who may lack this experience.

Additionally, another factor significantly associated with EBF in our study was the mode of delivery. Emergency C-sections were linked to lower EBF rates, which may be due to the disruption of early mother-infant bonding and the delayed initiation of breastfeeding. This delay can affect the establishment of breastfeeding, as also reported by Lande et al., (2020) in Georgia and Jiang et al., (2022) in China, who found that cesarean deliveries, particularly emergency ones, were barriers to successful EBF.

The place of delivery also played a significant role, with mothers who delivered in tertiary care facilities being less likely to exclusively breastfeed compared to those who delivered at home. This may be due to the highly structured environment of tertiary care facilities, which can interfere with breastfeeding practices (Lande, et al.,2020). Tertiary care facilities often prioritize medical interventions that might delay or disrupt breastfeeding initiation, as identified by Lande et al., (2020) in Geogia in their study on hospital-related barriers to EBF.

Also in this study, the use of anesthesia during delivery was found to negatively impact EBF, as mothers who did not use anesthesia were more likely to exclusively breastfeed. After receiving anesthesia, some mothers may experience physical discomfort, reduced mobility, or a delayed ability to engage in skin-to-skin contact and initiate and sustain breastfeeding, which could contribute to lower EBF rates (French, et al., 2016, Chaplin, et al., 2016). Also, some have sedative effects which might delay the onset of lactation (Karasu, et al., 2018). This is supported by findings from Martinez-Vasquez et al., (2022) in Spain, who noted that epidural anesthesia was associated with reduced EBF rates, possibly due to delayed lactogenesis.

Pregnancy and birth complications also had a significant impact on EBF. Mothers without complications were more likely to exclusively breastfeed, consistent with Sokou et al.'s (2022) findings in Greece, where mothers with complications like antepartum haemorrhage significantly hindered breastfeeding. However, Lande et al., (2020) in Georgia found no association, indicating that the impact of complications on EBF may vary across different settings.

Furthermore, gestational age played a significant role, with term infants being more likely to be exclusively breastfed compared to preterm infants. This can be attributed to the medical complexities and feeding difficulties often faced by these infants. Premature infants may have weaker sucking reflexes and may require specialized feeding methods, which can make EBF more challenging. While maternal milk, especially colostrum, is vital for preterm infants, only about 30% of mothers with extreme or very preterm can exclusively provide breast milk in the early days (Jónsdóttir, et al., 2020). This challenge, compounded by the difficulty in maintaining adequate milk supply, can lead to psychological stress and potentially cessation of breastfeeding (Jónsdóttir, et al., 2020). Studies by Lande et al. (2020) in Georgia and Jiang et al., (2022) in China have similarly found that these factors hinder exclusive breastfeeding, highlighting the need for enhanced breastfeeding support in NICUs and during follow-up care.

Mothers with single births were also more likely to exclusively breastfeed compared to those with multiple births. This finding may be explained by the increased physical and emotional demands of caring for multiple infants, which can make exclusive breastfeeding more challenging (Porta et al., 2019). Martinez-Vasquez et al., (2022) and Porta et al., (2019) in Spain reported lower EBF rates in cases of multiple pregnancies, suggesting that these mothers may need additional breastfeeding support and resources to successfully breastfeed exclusively.

Another important factor was skin-to-skin contact at birth, which significantly increased the likelihood of EBF. This practice promotes early bonding and stimulates the infant's natural reflexes to latch onto the breast, thereby facilitating the initiation and continuation of breastfeeding (Moore, et al., 2016). This finding is corroborated by Sokou et al., (2022) in Greece, who emphasized the importance of early mother-infant bonding. Health policies should continue to promote skin-to-skin contact immediately after birth to support EBF.

Early initiation of breastfeeding was also strongly associated with higher EBF rates. Initiating breastfeeding within the first hour after birth helps establish the mother's milk supply and ensures that the infant receives colostrum, which is crucial for the infant's immunity (Atimati & Adam, 2020). This finding aligns with the study by Martinez-Vasquez et al., (2022) in Spain, which identified early initiation as a key factor in sustained breastfeeding post-discharge. Health facilities should prioritize practices that support the early initiation of breastfeeding to improve EBF outcomes.

Lastly, breastfeeding support by health workers was found to significantly increase EBF rates in this study. This support can take the form of guidance on breastfeeding techniques, encouragement, and addressing any concerns or challenges that the mother may face (Rollins, et al., 2016). Wang et al., (2022) in China highlighted the importance of professional support in maintaining EBF, especially for preterm or low-birth-weight infants. Ensuring that health workers are well-trained in lactation support and that mothers have access to this support can greatly enhance EBF rates (Rollins, et al., 2016).

The study captures data at a single point in time, which limits the ability to infer causality between identified factors and exclusive breastfeeding (EBF) rates. Reliance on maternal recall for EBF practices may introduce recall bias, especially concerning breastfeeding initiation and practices during the neonatal unit stay.

## 5. CONCLUSION

The study identified key factors influencing exclusive breastfeeding (EBF) among infants on follow up after discharge from SCBU, with a prevalence of 40.3%. Factors such as early skin-to-skin contact, timely initiation of breastfeeding, and support from health workers were significant in promoting EBF. However, challenges like multiple births, the use of anesthesia, and preterm delivery were associated with lower EBF rates. These findings highlight the need for targeted interventions to improve EBF practices in similar settings.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## CONSENT

It is not applicable.

## ETHICAL CONSIDERATION

Ethical approval was obtained from the Research and Ethics Committee of FMCY

(FMCY/REC/ECC/2024/JANUARY/664). Written informed consent was obtained, ensuring understanding, voluntariness and confidentiality. Those not doing exclusive breastfeeding were further counselled on the benefits and the need for it.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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