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Breastfeeding Practices of women recently delivered at Omdurman Maternity Hospital, Sudan: A prospective study

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Article

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Abstract

Background: Breastfeeding promotes optimal infant growth and development and protects against infections. This study aimed to assess the prevalence of early initiation of breastfeeding and exclusive breastfeeding among recently delivered Sudanese women.

Methods: A prospective study was conducted using face-to-face interviews with mothers who had recently delivered at a major maternity hospital in Sudan between August and December 2022. Mothers who delivered healthy, full-term newborns were eligible. Data were collected on intended feeding practices for the first six months. Multiparous mothers were additionally asked about feeding methods used with previous children and the reasons underlying their choices.

Results: A total of 3,491 mothers participated, of whom 27.1% delivered by cesarean section and 28.2% were primiparous. Early initiation of breastfeeding within one hour of birth was reported by 70.4% of mothers. Exclusive breastfeeding was practiced by 68.9%, and 61.3% of these mothers intended to continue exclusive breastfeeding for six months. Combined breastfeeding with prelacteal feeding was planned by 35.4% of participants, while only 3.3% opted for exclusive formula feeding. Among multiparous mothers, 21.6% reported exclusive breastfeeding for six months or less, 52.1% for 13–24 months, and 3.3% for more than two years. Key factors influencing feeding practices included previous breastfeeding experience, mode of delivery, and maternal employment status.

Conclusion: The prevalence of early initiation and exclusive breastfeeding observed in this cohort is encouraging and exceeds rates reported in several African and Arab countries. Addressing modifiable barriers to breastfeeding is essential to sustain and further improve optimal breastfeeding practices.

Background

Breastfeeding is the natural method, and breast milk provides complete and optimal nutrition for newborns. It enhances babies' cognitive and intellectual development and defends them against severe infectious diseases, which can have serious consequences [1–4]. Early initiation of breastfeeding and continuing it beyond the first year are associated with lower infant morbidity and mortality [5–7]. Besides strengthening immunity and protecting infants from infections, breastfeeding has anti-allergic properties, promotes healthy dental development, and lowers the risk of childhood overweight and obesity [8–10]. It also fosters a social and psychological bond between mother and baby, creating feelings of love, protection, and security [11]. Furthermore, breastfeeding offers protection for nursing mothers against breast cancer, aids in birth spacing, and may decrease the risk of ovarian cancer and type 2 diabetes [12, 13]. In today’s era of the global obesity pandemic and its serious effects on public health and healthcare costs, promoting breastfeeding and supporting mothers who breastfeed are crucial strategies for obesity prevention [14, 15]. The World Health Organization (WHO) continues to emphasize the substantial health benefits of breastfeeding for both infants and mothers. It recommends initiating breastfeeding within the first hour after birth, exclusively breastfeeding for the first 6 months of life, and continuing breastfeeding until 2 years of age or beyond [16]. One of the six global child health goals set

by WHO for 2025 is to achieve a 50% rate of exclusive breastfeeding during the first six months of life [17]. To support this goal, WHO and UNICEF launched the Baby-Friendly Hospital Initiative (BFHI) in 1991, aiming to ensure that all hospitals and maternity clinics actively promote breastfeeding [18]. The initiative discourages the use of infant formula in neonatal care units and for babies born via cesarean section unless medically indicated, and advocates restricting infant formula sales to pharmacies, requiring a doctor's prescription. Interventions such as BFHI accreditation, breastfeeding counseling, and healthcare worker training have been shown to improve adherence to WHO-recommended feeding practices. Sudan joined the initiative in 1995, and several of its hospitals, including Omdurman Maternity Hospital, are now listed on UNICEF's global registry of Baby-Friendly hospitals. Despite growing worldwide awareness of the benefits of exclusive breastfeeding and increasing willingness among mothers, particularly in developing countries, numerous studies continue to report high rates of early discontinuation [19, 20]. The most prevalent reasons for this disappointing outcome are maternal fatigue, postpartum depression, type of delivery, return to work, and lack of family and community support for lactating mothers. Sudan is one of the largest countries in Africa, covering 1.886 million square kilometers, with a population of 41 million and a diverse mix of Africans, Arabs, and Afro-Arabs. It is among the least developed countries in the world, according to the United Nations classification, with an annual per capita GDP of $977 in 2018. Administratively, Sudan is divided into 18 states. Khartoum State is the most populous, with 8 million residents according to the 2018 national census [21]. Rates of infant mortality, under-five mortality, and maternal mortality are alarmingly high. According to UNICEF and the World Bank, the 2022 infant mortality rate was 39.2 per 1,000 live births, the under-five mortality rate was 50.1 per 1,000 live births, and the maternal mortality ratio was 270 per 100,000 live births. The global rates are 19 and 37 per 1,000, respectively, and 197 per 100,000 [22]. Most deliveries occur at home (80%), and a minority occur at health facilities. Sudanese cultural norms favor breastfeeding; however, numerous factors influence its timely initiation and exclusivity. A 2020 cross-sectional analysis from a multiple-indicator countrywide survey examined early feeding practices and associated factors in Sudan [23]. It analyzed data from 5,622 mother-infant pairs and found that 69% of mothers had initiated breastfeeding within one hour of birth. However, only 51% practiced both early initiation and refraining from prelacteal feeding. Factors negatively associated with optimal early feeding included delivery by cesarean section (C-section) and hospital births. Delayed initiation was related to maternal medical conditions and newborn health issues. Exclusive breastfeeding rates in Sudan have shown progressive improvement in the last two decades. According to UNICEF 2020 data, 62.3% of children are exclusively breastfed for the first six months of life [24]. The factors influencing that favorable practice include maternal education, employment status, and cultural beliefs. Mothers with higher education and those unemployed were more likely to breastfeed exclusively for six months. Maternal employment and cultural beliefs, such as the notion that infants should be given water in between the breastfeeds, hinder exclusive breastfeeding. Several studies had previously addressed infant feeding, infant mortality, and child nutrition in Sudan [25–29]. Most of these studies were community-based and involved small numbers of mothers. Hence, there is a lack of hospital-based data on early feeding practices and intentions regarding the continuation of breastfeeding of recently delivered mothers. This study aimed to

determine the intention to breastfeed among recently delivered mothers in a maternity hospital, the previous feeding practices of multiparous mothers, and the factors that affect their choices.

Methods

Study design and setting

This prospective study employed face-to-face interviews with mothers who had recently delivered at Omdurman Maternity Hospital (OMH) in Khartoum State, Sudan. OMH is the largest maternity hospital in the country, with more than 30,000 deliveries annually. The study was conducted over six months from August to December 2022.

Participants

All mothers who delivered healthy, full-term newborns during the study period were eligible for inclusion. Mothers who delivered preterm infants and/or neonates requiring admission to the neonatal intensive care unit (NICU) were excluded.

Data collection

Interviews were conducted on the second or third day postpartum by a trained physician. Participants' responses were recorded using a structured data collection form. Collected data included maternal demographic characteristics, mode of delivery, infant sex, parity, and maternal knowledge of the benefits of breastfeeding for both the infant and the mother. Information on intended infant feeding practices for the newborn period was also obtained. Multiparous mothers were additionally asked about feeding methods used with previous children and the reasons for their choices.

Ethical approval and informed consent

All study procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and the Declaration of Helsinki and its later amendments. Ethical approval was obtained from the Research Board of the Ministry of Health, Khartoum, Sudan (EA 2022/06/n 19). Written informed consent was obtained from all participants before enrollment.

Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS), version 29. Categorical and continuous variables were summarized using frequencies and percentages. Associations between variables were assessed using odds ratios and the chi-square test. A p-value of < 0.05 was considered statistically significant.

Results

A total of 3,491 Sudanese mothers were enrolled in the study, all of whom resided in Khartoum State. The demographic characteristics and selected obstetric histories of the participants are summarized in Table 1. Maternal age ranged from 18 to 44 years, and the majority lived in urban areas (91.2%). Most mothers had received formal education, with only 8.4% reporting no formal schooling. Nearly half (49.6%) had completed secondary education, while 9.1% had attained university-level education. Socioeconomic status was categorized as poor in 19.1% of participants, fair in 48.9%, and wealthy in 32.0%.

Assessment of maternal knowledge regarding the benefits of breastfeeding for both the infant and the mother revealed that 88.3% had sufficient knowledge, whereas 11.7% had insufficient knowledge. Vaginal delivery was reported by 72.9% of mothers, while 27.1% delivered by cesarean section. Primiparous mothers accounted for 28.2% of the cohort. Female infants comprised 50.6% of all newborns.

Early initiation of breastfeeding within the first hour after birth was reported by 2,458 mothers (70.4%), all of whom delivered vaginally. None of the mothers who delivered by cesarean section had initiated breastfeeding within the first hour. Avoidance of prelacteal feeding was reported by 68.9% of participants.

Feeding practices immediately after birth and planned feeding methods during the first six months are presented in Table 2. Exclusive breastfeeding without prelacteal feeding was practiced by 68.9% of mothers. Non-exclusive breastfeeding was reported by 27.8%, while 3.3% of mothers relied exclusively on formula feeding.

Table 1: Characteristics of mothers and early feeding practices

Criterion	N (%)	Early Breastfeeding	Avoiding prelacteal feeding
	3491 (100.0)	2458 (70.4)	2405 (68.9)
Maternal age			
18-24	0901 (25.8)	0617 (25.1)	0512 (21.3)
25-34	1746 (50.0)	1001 (40,7)	1064 (44.2)
35+	0844 (24.2)	0840 (34.2)	0829 (34.5)
Mothers' education			
None	0293 (8.4)	0201 (8.2)	0103 (4.3)
Primary	1148 (32.9)	0739 (30.1)	0687 (28.6)
Secondary	1732 (49.6)	1201 (48.8)	1297 (53.9)
Higher	0318 (9.1)	0317 (12.9)	0318 (13.2)
Mothers' employment			
Employee	0335 (9.6)	0331 (13.5)	0299 (12.4)
housewife	3156 (90.4)	2127 (86.5)	2106 (87.6)
Permanent residence			
Rural	0307 (8.8)	0300 (12.2)	0202 (8,4)
Urban	3184 (91.2)	2158 (87,8)	2203 (91.6)
Socio-economic			
Poor	0667 (19.1)	0666 (27.1)	0616 (25,6)
Fair	1707 (48.9)	0971 (39.5)	0970 (40.3)
Wealthy	1117 (32.0)	0821 (33.4)	0819 (34.1)
Knowledge of the benefits of BF			
insufficient	0408 (11.7)	0351 (14.3)	0250 (10.4)
sufficient	3083 (88.3)	2107 (85.7)	2155 (89.6)
Mode of delivery			
C-section	0946 (27.1)	Zero (0)	Zero (0)
Vaginal	2545 (72.9)	2458 (100)	2405 (100)
Gender of newborn			

Boy	1725 (49.4)	1238 (50.4)	1204 (50.1)
Girl	1766 (50.6)	1220 (49.6)	1201 (49.9)
Previous births			
None	0985 (28.2)	0740 (30.1)	0588 (24.4)
1+	2506 (71.8)	1718 (69.9)	1817 (75.6)

All mothers who used exclusive formula feeding had delivered by cesarean section and planned to continue this feeding method throughout the first six months of life. Overall, 2,140 mothers (61.3%) intended to breastfeed exclusively until six months of age, whereas 1,235 mothers (35.4%) planned to practice non-exclusive breastfeeding during this period.

Table 2: Current and intended feeding patterns for the Newborns (n= 3491)

Feeding Pattern	N (%)
Current Feeding Method	
Exclusive Breastfeeding	2405 (68.9)
Exclusive Formula	0116 (3.3)
Breastfeeding plus formula	0377 (10.8)
Breastfeeding plus water	0593 (17.0)
Intended feeding till age 6 months	
Exclusive Breastfeeding	2140 (61.3)
Exclusive Formula	0116 (3.3)
Breastfeeding plus formula	0503 (14.4)
Breastfeeding plus water	0732 (21.0)

Comparative rates of exclusive breastfeeding during the first six months of life in Sudan and selected countries from Africa and the Middle East are shown in Table 3.

The duration of breastfeeding among previous children of multiparous mothers is summarized in **Table 4**. More than half of mothers (52.1%) reported breastfeeding for 13–24 months, while 21.4% breastfed for 7–12 months. Breastfeeding for six months or less was reported by 21.6% of mothers, and only 4.9% continued breastfeeding beyond two years of age.

Table 3: Rates of exclusive breastfeeding (EBF) for six months in Sudan and some African and Arab countries/Regions.

Country/Region	EBF average %	Year	Source
Sudan	62.3	2019	UNICEF/WHO
Africa:			
Ethiopia	58.0	2016	DHS 2016
Kenya	61.4	2014	DHS 2014
Uganda	66.0	2016	DHS 2016
South Africa	32.0	2016	UNICEF/WHO
Middle East:			
Egypt	39.7	2014	DHS 2014
Jordan	25.5	2018	DHS 2018
Yemen	46.0	2013	DHS 2013
Saudi Arabia	30.0	2014	UNICEF/WHO
Regions:			
Eastern Africa	59.1	2021	FAO 2021
Northern Africa	40.8	2020	NICEF
Sub-Saharan Africa	44.3	2021	FAO 2021
Middle East	36.9	2020	FAO 2021

* DHS is the Demographic and Health Surveys (DHS) Program.

Table 4: Length of Breastfeeding of previous children of 2506 mothers

Duration of Breastfeeding	number (%)
<4 months	0175 (7.0)
4-6 months	0366 (14.6)
7-12 months	0536 (21.4)
13-24 months	1306 (52.1)
>24 months	0123 (4.9)

Mothers reported multiple factors influencing their feeding practices for both their recently born infants and previous children, yielding a total of 5,411 responses (Table 5).

Table 5. Factors affecting mothers' intended and previous feeding practices (n=5411)

Influencing factors	Number (%)
Socio-economic conditions	1033 (19.1)
C-section delivery	1009 (18.6)
Cultural beliefs	0748 (13.8)
Family support	0632 (11.7)
Mothers' employment	0510 (9.4)
Religious values	0281 (5.2)

The most frequently cited factors were socioeconomic conditions (19.1%) and cesarean delivery (18.6%). Additional influences included cultural beliefs (13.8%), family support (11.7%), maternal employment (9.4%), and religious values (5.2%).

Logistic regression analyses were performed to examine the association between infant feeding practices and maternal and neonatal characteristics. Multiparous mothers had significantly higher odds of early initiation of breastfeeding compared with primiparous mothers. Optimal feeding practices, defined as early initiation of breastfeeding and avoidance of prelacteal feeding, were approximately twice as likely among mothers residing in urban areas compared with those living in rural settings. Maternal age was also a significant predictor, with mothers aged 35 years or older demonstrating 25% higher odds of optimal feeding practices than mothers aged 24 years or younger. In contrast, cesarean delivery was strongly associated with reduced odds of optimal feeding practices compared with vaginal delivery. No significant associations were observed between feeding practices and maternal education level or infant sex.

Discussion

The rates of early initiation of breastfeeding (70.4%) and exclusive breastfeeding immediately after birth (68.9%) observed in this study are encouraging and exceed the World Health Organization (WHO) 2025 global target of 50%. This target was largely informed by declining breastfeeding trends in industrialized countries (30). The exclusive breastfeeding rate in the present study is also higher than the 2019 WHO/UNICEF estimate for Sudan (62.3%) and rates reported in neighboring countries such as South Sudan and Ethiopia. In addition, the prevalence of early initiation surpasses Sudan's 2010 national estimate [31] and most rates reported across sub-Saharan Africa. It is also higher than those documented in several Arab countries, including Egypt, Jordan, and Tunisia [32]. However, early initiation rates remain lower than those reported in certain Eastern African countries, such as Malawi and Rwanda [33].

Variations in breastfeeding indicators between countries may be attributed to differences in maternal awareness of breastfeeding benefits, sociocultural practices surrounding prelacteal feeding, the influence of family elders, and disparities in healthcare systems and professional support during childbirth. In the present study, household socioeconomic status was not significantly associated with breastfeeding outcomes, a finding consistent with reports from Tanzania [34].

Primiparous mothers comprised 28.2% of the study population. Targeted interventions to support and educate first-time mothers may therefore improve exclusive breastfeeding rates and extend breastfeeding duration in subsequent pregnancies. Although most mothers in this cohort were educated and familiar with social media, delayed initiation of breastfeeding was more common among mothers with a university education (9.1%). This finding contrasts with previous reports indicating higher rates of early initiation among college graduates [35]. However, maternal education was not a significant determinant of breastfeeding practices in this study. Similar findings have been reported from Sudan and South Sudan [36, 37].

Only a small proportion of mothers (3.3%) opted for exclusive formula feeding. The primary reasons cited included cesarean delivery, difficulties in establishing breastfeeding due to inadequate antenatal counseling, and maternal anxiety. These findings underscore the importance of effective prenatal education and postnatal support to promote breastfeeding confidence and success.

Regarding breastfeeding duration among previous children, more than half of the mothers (52.1%) reported breastfeeding for longer than 12 months, and 4.9% continued beyond 24 months. Maternal age and parity were the only factors significantly associated with longer breastfeeding duration. Older mothers and those with more children were more likely to breastfeed, likely to reflect the cumulative experience gained from raising previous children. Similar associations between maternal age, parity, and breastfeeding duration have been reported in Japan [38]. In contrast, a study from Australia suggests that both parity and maternal education influence optimal breastfeeding practices [39], highlighting the context-specific nature of these determinants.

It is concerning that 21.6% of mothers reported breastfeeding their previous children for six months or less. Reported reasons included perceptions of insufficient milk supply, infant refusal of the breast, cesarean delivery, maternal fatigue, and early return to work. Comparable findings have been documented in studies from China [40] and South Africa, where maternal fatigue and employment were major contributors to early breastfeeding cessation [41].

Cesarean delivery has been consistently associated with delayed initiation and lower rates of exclusive breastfeeding. Surgical delivery limits immediate skin-to-skin contact and may encourage prelacteal feeding due to postoperative pain, anesthesia effects, and maternal discomfort [42, 43]. Additionally, concerns about medication exposure through breast milk may discourage mothers from initiating breastfeeding soon after birth [44]. Given that more than one-quarter of mothers in this study delivered by cesarean section, targeted strategies to support breastfeeding following surgical delivery are urgently needed.

Lack of social and professional support remains a major barrier to successful breastfeeding. Support from family members, healthcare providers, and community health systems, particularly for first-time mothers, has been shown to significantly improve breastfeeding initiation, exclusivity, and duration [45]. Other factors influencing breastfeeding success include maternal and infant health, rooming-in practices, and the length of maternity leave for working mothers [46]. Addressing these factors requires coordinated national policies to strengthen breastfeeding-friendly healthcare environments. Targeted prenatal breastfeeding education and counseling are proven strategies for enhancing breastfeeding practices, with the greatest impact observed among younger, less experienced mothers.

Conclusion

Although the breastfeeding indicators reported in this study are encouraging, sustained and coordinated efforts are required to maintain and further improve these outcomes, especially during the ongoing armed conflict in Sudan. Addressing modifiable barriers, such as high cesarean section rates, insufficient social and professional support, and gaps in antenatal breastfeeding education, is essential to promoting optimal breastfeeding practices. The effective use of social media as an educational tool [47] offers a promising, innovative approach to enhancing breastfeeding awareness and supporting maternal and child health in resource-constrained settings.

Declarations

Ethical approval and informed consent:

All study procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and the Declaration of Helsinki and its later amendments. Ethical approval was obtained from the Research Board of the Ministry of Health, Khartoum, Sudan (EA 2022/06/n 19). Written informed consent was obtained from all participants before enrollment

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Availability of data and materials: The data obtained and analyzed during this study are available from the corresponding author upon reasonable request.

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Authors' Roles/Contributions:

1. **Dr. Afaq Mohamed** served as the principal investigator. She was responsible for the overall conceptualization and design of the research project, provided continuous supervision throughout the

study, and reviewed the final manuscript with substantive input.

2. **Dr. Walaa Elamin** participated in data collection, conducted interviews with mothers, and completed data collection forms alongside two coauthors.

3. **Dr. Safaa Eltahir** contributed to data collection by conducting interviews with mothers and completing data collection forms in collaboration with two coauthors.

4. **Dr. Ahmed Abdelaziz** was involved in data collection, participated in interviews and form completion, and conducted the statistical analysis of the results.

5. **Dr. Abdelaziz Elamin** contributed to the conceptualization and design of the study, drafted all versions of the manuscript, and provided critical revisions to ensure scientific rigor and clarity before submission.

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