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Barriers to Exclusive Breastfeeding Among Nursing Mothers at Tamale West Hospital: A Cross-Sectional Study

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Abstract

Background:

The World Health Organization recommends exclusive breastfeeding (EBF) as the primary nutritional requirement for the first six months of an infant's life. However, various factors may influence whether mothers practice EBF effectively. The goal of this study is to evaluate the knowledge level, constraints, and maternal factors associated with exclusive breastfeeding practices among nursing mothers attending postnatal care at a tertiary teaching hospital in Ghana-West Africa.

Methods:

A facility-based cross-sectional study was conducted among nursing mothers at Tamale West Hospital, Ghana. Using Cochran's formula, 382 participants were selected through simple random sampling. Data were collected using a structured questionnaire and analyzed with STATA. Descriptive statistics and inferential analyses were performed at a 5% significance level.

Results:

Mothers reported several constraints, notably insufficient breastmilk production (M = 4.82, SD = 3.43), cracked or sore nipples (M = 4.03, SD = 3.12), and shyness when breastfeeding in public (M = 3.61, SD = 3.01). Constraint scores did not differ significantly between exclusive and non-exclusive breastfeeding groups. Maternal age ($\chi^2 = 237.71$; $p < 0.001$), educational status ($\chi^2 = 294.90$; $p < 0.022$), employment status ($\chi^2 = 301.26$; $p < 0.000$), parity ($\chi^2 = 404.37$; $p < 0.020$), and mode of delivery ($\chi^2 = 298.45$; $p < 0.003$) were significantly associated with EBF practices.

Conclusion:

Nursing mothers generally have good knowledge of exclusive breastfeeding yet face multiple constraints that can hinder its practice. Addressing these barriers and considering maternal factors such as age, education, and employment status are essential to improving exclusive breastfeeding rates and ensuring optimal infant nutrition.

BACKGROUND

Exclusive breastfeeding (EBF)—the practice of feeding infants only breast milk for the first six months of life—plays a pivotal role in promoting optimal infant growth, health, and survival.[1] Breast milk provides immunoglobulins that protect against infections and offers a safe, hygienic, and nutritionally complete food source for infants.[2] Additionally, breastfeeding benefits mothers by reducing the risk of certain

cancers and type 2 diabetes, while also being more cost-effective than formula feeding.′ Despite these advantages, only 41% of infants under six months of age worldwide were exclusively breastfed in 2019, falling short of the global targets of at least 50% by 2025 and 70% by 2030. Just 37% of infants younger than six months old in low- and middle-income nations receive all their breast milk. Several nations have largely embraced the WHO's 6-month EBF policy. Nevertheless, most babies are not EBF at six months, especially in developed nations.

In Ghana, infant mortality is strongly linked to suboptimal breastfeeding and infant feeding practices. Between 2006 and 2010, 63% of infants under six months were exclusively breastfed, a modest increase from 53.4% in 2003. Although progress has been attributed in part to increased maternal education, numerous barriers remain. Mothers often face conflicting advice, social pressure to introduce water or artificial feeds, and the belief that breast milk alone is insufficient (Diji et al., 2017). Furthermore, anecdotal evidence from Tamale West Hospital suggests some mothers perceive exclusively breastfed infants to have poorer appetites when transitioning to complementary foods compared to those who were not exclusively breastfed. Working mothers cite limited time and inadequate support after maternity leave as disincentives to continue exclusive breastfeeding. Research also indicates that close relationships, or cultural guardians can negatively influence breastfeeding decisions and the burden of household duties further complicates EBF. ″

Several national policies and initiatives—such as the National Child Health Policy, the Baby-Friendly Hospital Initiative, and the National Nutrition Policy—have been introduced in Ghana to promote breastfeeding initiation and sustain EBF among infants under six months. While these efforts aim to reduce infant mortality and improve child health, exclusive breastfeeding rates remain below expectations (Agunbiade & Ogunleye, 2012; Ghana Health Service, 2018; Mohammed et al., 2023).″A particular gap in the literature concerns the specific challenges mothers in the formal sector face, especially those receiving postnatal care at Tamale West Hospital, who may struggle to balance workplace demands with the recommended EBF duration.

This study was designed to investigate the barriers to exclusive breastfeeding among nursing mothers attending postnatal care at Tamale West Hospital in Tamale. By examining maternal perceptions, workplace constraints, cultural influences, and the availability of support systems, the research seeks to identify key factors that hinder EBF practice. The findings will provide valuable insights for policymakers, healthcare providers, and employers, informing targeted interventions to improve exclusive breastfeeding rates. Ultimately, the findings will contribute to the broader literature on breastfeeding promotion, guiding policymakers and healthcare providers in developing context-specific solutions that ensure both mothers and infants reap the full benefits of exclusive breastfeeding.

METHOD AND MATERIALS

Study Design

A facility-based cross-sectional study design using a survey method was used to design the study. The research used quantitative data approach to gather the primary data. The study population consisted of nursing mothers attending postnatal care (PNC) at Tamale West Hospital (TWH), focusing on those with babies less than a year old who were still breastfeeding. Inclusion criteria were nursing mothers aged 15–44 attending PNC at TWH, with at least one child under a year old who were still breastfeeding, and able to speak English or a local language. Exclusion criteria included nursing mothers outside the reproductive age range, those with terminal illnesses, and those who refused to sign the consent form. All methods were performed in accordance with the relevant guidelines set forth by the Ghana Health Service research regulations.

Sampling Technique and Sample Size

A simple random sampling method was used to collect quantitative data from nursing mothers attending postnatal care (PNC) at Tamale West Hospital (TWH). The sample size was determined using the Cochran formula, resulting in 382 participants. Data were gathered using a structured questionnaire adapted from a validated instrument, covering demographic characteristics, knowledge on exclusive breastfeeding practices, associated challenges, and influencing factors. The questionnaire's validity was ensured through peer review and pre-testing at Vitting Health Centre, achieving acceptable Cronbach Alpha values. Three trained research assistants collected data after obtaining ethical approval from the Ghana Health Service Ethics Review Committee and entry permission from relevant authorities. Data collection occurred at the PNC Unit over a period of six months. Consent was obtained from all participants prior to enrolling in this study.

Data Analysis

Data analysis was done shortly after data collection was completed. Then the Statistical Package for Service Solution (SPSS) software version 25.0 was used to analyze the data. SPSS Data was cleaned by screening for missing values, checking normality and outliers, as well as checking the homogeneity of the data using histogram, frequency and box plots respectively. As a statistical rule, missing variables were less than 5%, and they were deleted. Data analysis was done based on the themes drawn from the specific objectives. Descriptive analyses were done to ascertain the factors by knowledge and constrains of exclusive breastfeeding practices of the respondents. Chi-square analysis was used to establish the association between the categorical variables. The Mann-Whitney U test was used to compare the distributions of various factors (e.g., insufficient milk production, cracked or sore nipples, discomfort when breastfeeding in public) between two independent groups: exclusive breastfeeding (EBF) and non-exclusive breastfeeding (Non-EBF) mothers. All statistical tests that were performed used two-sided tests at the 0.05 level of significance. In the study, a knowledge index was created through the sum of binary input variables, where the highest and lowest values were selected for each underlying pointer. The enactment of individually pointer was articulated using a unit-free index between 0 and 1 in accordance with the structure technique of the Human Development Index (UNDP, 2005).

Knowledge index =	**(Actual value – Minimum value)**
	(Maximum value – Minimum value)

The scores were created then categorized as the group labelled as poor and good knowledge (Oh et al., 2011; UNDP, 2005). Before measuring the level of knowledge using consistent or reliability of respondent's answer. The knowledge score is poor at 0–4 and good at 5–9 (Oh et al., 2011). ' In determining the constraints associated with exclusive breastfeeding practices, descriptive statistics, mean (M), standard deviation (SD), median (interquartile range) and chi-square were used.

RESULTS

Demographic Characteristics of Nursing Mothers

In the study, 382 nursing mothers attending PNC services between July to December, 2023 were involved in the study. Majority (54.45%) of the nursing mothers were between the ages of 26 to 35, while 25.39% by those between the ages of 36 to 44, and 20.16% were between 15 to 25 years of age. Over half of the respondents (62.83%) were married, and the remaining 37.17% were unmarried. Nearly equal proportions identified as Christian (52.09%) or Muslim (47.91%). Several of the respondents (69.12%) practiced exclusive breastfeeding whereas the remaining ones (30.88%) could not do so (Table 1).

In terms of breastfeeding practices, 69.12% reported practicing exclusive breastfeeding (EBF), whereas 30.88% did not. With respect to education, 17.02% had no formal education, 40.31% had basic education, 33.25% had secondary-level education, and 9.42% had tertiary education. About one-third (28.27%) of participants had no children prior to the current infant (parity 0), 35.86% had one child, 25.13% had 2–3 children, and 10.74% had more than three children.

Regarding employment, 33.25% of respondents were unemployed, 55.50% were employed, and 11.25% were housewives. Monthly income levels were split between those earning less than 1,000 GHS (42.93%) and those earning above 1,000 GHS (57.07%). Ethnically, over half of the sample identified as Gonja (51.04%), followed by Mamprusi (25.66%), Akan (8.64%), and other ethnic groups (14.66%). (Table 1)

Table 1
Demographic Characteristics of participants

Variables Category		Frequency (N = 382)	Percent
Age (years)			
	15–25	77	20.16
	26–35	208	54.45
	36–44	97	25.39
Marital status			
	Unmarried	142	37.17
	Married	240	62.83
Religion			
	Christianity	199	52.09
	Islam	183	47.91
Breastfeeding practices			
	EBF practices	264	69.12
	Non-EBF practices	118	30.88
Educational status			
	No formal education	65	17.02
	Basic education	154	40.31
	Secondary	127	33.25
	Tertiary	36	9.42
Parity			
	0	108	28.27
	1 child	137	35.86
	2–3 children	96	25.13
	3 + Children	41	10.74
Occupational status			
	Unemployed	127	33.25
	Employed	212	55.50
	Housewife	43	11.25

Variables Category		Frequency (N = 382)	Percent
Monthly income			
	< 1,000 GHS ($65)	164	42.93
	> 1,000 GHS ($65)	218	57.07
Ethnicity			
	Gonja	195	51.04
	Mamprusi	98	25.66
	Akan	33	8.64
	Others	56	14.66

Knowledge of Exclusive Breastfeeding among Nursing Mothers

This study revealed that nursing mothers have good knowledge of exclusive breastfeeding practices. The knowledge score is poor at 0–4 and good at 5–9 (Ling et al., 2011). Individually, approximately 66% of nursing mothers aged 36–44 years had good knowledge of exclusive breastfeeding practices as compared to those between 15–25 years (53.25%). Majority of the married women (59.17%) had poor knowledge of exclusive breastfeeding practices while a large portion of the unmarried women (54.23%) had good knowledge of exclusive breastfeeding practices. Additionally, participants who identified as Christians (60.80%) exhibited good knowledge of exclusive breastfeeding practices as compared to Muslims (40.98%). In relation to nursing mother knowledge of exclusive breastfeeding practices and educational level, only few (27.69%) with no formal education had good knowledge of exclusive breastfeeding practices. However, almost all of the respondents with either basic/secondary (71.89%) and tertiary education (94.44%) showed very good knowledge of exclusive breastfeeding practices.

The study, further, indicated that most nursing mothers had good knowledge of exclusive breastfeeding practices, and the knowledge level increases with parity. Those with one child (57.66%) had the least as compared to those with 2–3 children (68.46%) and above 3 children (72.92%). Both nursing mothers, either practicing exclusive or non-exclusive breastfeeding had good knowledge. Thus, those practicing non-exclusive breastfeeding recorded better knowledge score (68.64%) than their counterpart practicing exclusive breastfeeding (57.95%). In relation to employment status and knowledge of exclusive breastfeeding, several of the respondents reported poor knowledge of exclusive breastfeeding, those employed (37.26%) had the poorest followed by unemployed (40.16%) and housewife (48.84%). Also, nursing mothers with high monthly household income of > 1,000 GHS had good knowledge of exclusive breastfeeding practices whereas those with < 1,000 GHS (48.17%) had poor knowledge of exclusive breastfeeding practices.

In addition, demographic variables such as age of nursing mothers, marital status, educational status, parity, and breastfeeding practices showed statistically a significant ($p < 0.05$) relationship with knowledge of exclusive breastfeeding. However, religious affiliation, employment status and household income per month were the socio-demographic variables that had no significant relationship with knowledge on exclusive breastfeeding practices (Table 2).

Table 2
Knowledge of Exclusive Breastfeeding

Variables	Categories	Freq. (%)	Knowledge about EBF Practices		*p*-value
			Good	Poor	
Age (years)					0.002
	15–25	77 (20.16)	41 (53.25)	36 (46.75)	
	26–35	208 (54.45)	118 (56.73)	90 (43.27)	
	36–44	97 (25.39)	64 (65.98)	33 (34.02)	
Marital status					0.0001
	Unmarried	142 (37.17)	77 (54.23)	65 (45.77)	
	Married	240 (62.83)	98 (40.83)	142 (59.17)	
Religion					0.215
	Christianity	199 (52.09)	121 (60.80)	78 (39.20)	
	Islam	183 (47.91)	75 (40.98)	108 (59.02)	
Educational status					0.015
	No formal education	65 (17.02)	18 (27.69)	47 (72.31)	
	Basic/Secondary	281 (73.56)	202 (71.89)	79 (28.11)	
	Tertiary	36 (9.42)	34 (94.44)	2 (5.56)	
Parity					0.000
	1 child	137 (35.86)	79 (57.66)	58 (42.34)	
	2–3 children	149 (39.01)	102 (68.46)	47 (31.54)	
	3 + children	96 (25.13)	70 (72.92)	26 (27.08)	
Breastfeeding practices					0.002
	EBF practices	264 (69.12)	153 (57.95)	111 (42.05)	

Variables	Categories	Freq. (%)	Knowledge about EBF Practices		*p*-value
			Good	**Poor**	
	Non-EBF practices	118 (30.88)	81 (68.64)	37 (31.36)	
Employment status					0.122
	Unemployed	127 (33.25)	51 (40.16)	76 (59.84)	
	Employed	212 (55.50)	79 (37.26)	133 (62.74)	
	Housewife	43 (11.25)	21 (48.84)	22 (51.16)	
Household income					0.205
	< 1,000 GHS ($65)	164 (42.93)	79 (48.17)	85 (51.83)	
	> 1,000 GHS ($65)	218 (57.07)	148 (67.89)	70 (32.11)	
Knowledge score			**6.51**		

Constraints Associated with Exclusive Breastfeeding

The top three constraints of exclusive breastfeeding were insufficient production of breastmilk (mean = 4.82, standard deviation = 3.43); cracked or sored nipple (mean = 4.03, standard deviation = 3.12); and shyness when breastfeeding in public (mean = 3.61, standard deviation = 3.01). However, there were other constraints to exclusive breastfeeding such as socio-cultural pressure to introduce water and artificial feeds, perception that breastmilk is insufficient for baby; tight work schedule, domestic duties and short maternity leave. These constraints recorded total means between 2.70 (SD = 2.44) – 3.03 (SD = 2.77).

There was a significant difference between nursing mothers who practiced exclusive breastfeeding and those who did not in relation to the following constrains; insufficient breastmilk production (mean = 4.82, standard deviation = 3.43 at $p = 0.035$); cracked or sored nipple (mean = 4.03, standard deviation = 3.12, at $p = 0.002$); tight work schedule (mean = 2.98, standard deviation = 2.62, at $p = 0.005$); and short maternity leave (mean = 2.70, standard deviation = 2.44, at p = 0.003) (Table 3). However, no significant difference existed between the groups with the following constraints: shyness when breastfeeding in public, holding a perception that breastmilk is insufficient for baby, socio-cultural pressure to introduce water and artificial feeds and domestic duties.

In addition, comparing the mean of the two groups (Table 3), there was a subtle difference between nursing mothers who practiced exclusive breastfeeding and those who practiced mixed feeding in relation to constraints to exclusive breastfeeding scores, although not statistically significant. Evidence suggested that the mean scores of the two groups were closely related and almost virtually the same. For instance, nursing mother who practiced exclusive breastfeeding had total mean of 3.31 (SD = 1.93) whereas those who practiced mixed feeding reported a mean of 3.83 (SD = 2.75).

Table 3
Constraints Associated with Exclusive Breastfeeding Practices

Variables	Total M (SD)	EBF M (SD)	Non-EBF M (SD)	EBF Median (IQR)	Non-EBF Median (IQR)	Mann-Whitney U	p - value
Insufficient milk production	4.82 (3.43)	3.31 (1.93)	3.83 (2.75)	3 (2–5)	3 (2–5)	165.50	0.035
Cracked or sore nipples	4.03 (3.12)	2.90 (1.74)	3..69 (2.55))	3 (3–5)	3 (3–5)	155.00	0.002
Discomfort when breastfeeding in public	3.61 (3.01)	2.66 (1.72)	3.55 (2.48)	4 (3–4)	4 (3–5)	140.00	0.128
Socio-cultural pressure to introduce water and artificial feeds	3.12 (2.85)	2.38 (1.50)	3.54 (2.33)	3 (2–4)	3 (2–4)	350.50	0.055
Perception that breastmilk is insufficient for baby	3.03 (2.77)	2.11 (1.50)	3.38 (2.28)	4 (2–5)	4 (2–5)	350.00	0.051
Tight work schedule	2.98 (2.62)	2.09 (1.16)	3.18 (2.22)	3 (2–4)	3 (3–5)	330.00	0.005
Domestic duties	2.94 (2.53)	2.09 (1.16)	3. 04 (2.12)	3 (2–4)	3 (2–5)	310.00	0.400
Short maternity leave	2.70 (2.44)	2.04 (1.09)	2.85 (2.06)	4 (3–5)	4 (2–5)	300.50	0.003

M = Mean; SD = Standard deviation; IQR = Interquartile Range

Maternal Factors associated with Exclusive Breastfeeding Practices

Five maternal factors including maternal age, educational status, employment status, parity and mode of delivery, were significantly associated with exclusive breastfeeding practices. The maternal factors; maternal age ($\chi^2 = 237.71$; $p < 0.001$); educational status ($\chi^2 = 294.90$; $p < 0.022$); employment status ($\chi^2 = 301.26$; $p < 0.000$); parity ($\chi^2 = 404.37$; $p < 0.020$), and mode of delivery ($\chi^2 = 298.45$; $p < 0.003$) were significantly associated with exclusive breastfeeding practices at Tamale West Hospital. However,

marital status, breastfeeding initiation and duration, household income per month and HIV status had no significant association with exclusive breastfeeding practices (Table 4).

Table 4
Maternal Factors associated with Exclusive Breastfeeding Practices

Variables	Categories	N (%)	Exclusive breastfeeding practices		χ^2	Test statistic
			Poor N (%)	Good N (%)		(*p*-value)
Maternal age					237.71	0.001*
	15–25	77 (20.16)	33 (42.86)	44 (57.14)		
	26–35	208 (54.45)	121 (58.17)	87 (41.83)		
	36–44	97 (25.39)	52 (53.61)	45 (46.39)		
Educational status					294.90	0.022*
	No formal education	65 (17.02)	48 (73.85)	17 (26.15)		
	Basic/Secondary	281 (73.56)	112 (39.86)	169 (60.14)		
	Tertiary	36 (9.42)	25 (69.44)	11 (30.56)		
Employment status					301.26	0.000*
	Unemployed	127 (33.25)	28 (22.05)	99 (77.95)		
	Employed	212 (55.50)	41 (19.34)	171 (80.66)		
	Housewife	43 (11.25)	40 (93.02)	3 (6.98)		
Marital status					137.84	0.109
	Unmarried	142 (37.17)	92 (64.79)	50 (35.21)		
	Married	240 (62.83)	67 (27.92)	173 (72.08)		
Breastfeeding initiation and duration					85.65	0.089
	Early	200 (52.37)	84 (42.00)	116 (58.00)		

* Statistically significant at $p < 0.05$

Variables	Categories	N (%)	Exclusive breastfeeding practices		χ^2	Test statistic
			Poor N (%)	Good N (%)		(*p*-value)
	Late	182 (47.63)	81 (44.51)	101 (55.49)		
Parity					404.37	0.020*
	0	108 (28.27)	18 (16.67)	90 (83.33)		
	1 child	137 (35.86)	27 (19.71)	110 (80.29)		
	2 + children	137 (35.87)	63 (49.99)	74 (54.01)		
Household income per month (GH ¢)					283.09	0.163
	< 1,000 GHS	164 (42.93)	75 (45.73)	89 (54.27)		
	> 1,000 GHS	218 (57.07)	87 (39.91)	131 (60.09)		
HIV status					201.09	0.521
	Positive	0 (0.0)	0 (0.0)	0 (0.0)		
	Negative	382 (100.0)	256 (67.02)	126 (32.98)		
Mode of delivery					298.45	0.003*
	Normal vaginal delivery	209 (54.71)	99 (47.37)	110 (52.63)		
	Caesarean section (CS)	173 (45.29)	70 (40.46)	103 (59.54)		
* Statistically significant at $p < 0.05$						

DISCUSSION

This study revealed that nursing mothers attending postnatal care at Tamale West Hospital generally possess good knowledge of exclusive breastfeeding (EBF), as evidenced by a high overall knowledge score (6.51). This finding may be attributed to their levels of formal education—where many had at least basic or secondary education—and to the quality of postnatal education provided by the hospital. Comparable research in other Ghanaian settings and in various regions of Africa corroborates this result,

indicating that awareness of EBF and its benefits is widespread. However, as other studies have shown, awareness does not necessarily translate into high rates of sustained EBF.

Despite their strong knowledge base, participants reported multiple barriers that hindered continuous EBF. Insufficient breastmilk production emerged as the most common constraint, potentially influenced by factors such as postpartum stress, cesarean delivery, or the physiological delay in milk let-down. Cracked or sore nipples and discomfort with breastfeeding in public were also frequently mentioned, highlighting both physical and sociocultural challenges. These findings are consistent with earlier studies conducted in Ghana, Nigeria, and other regions, which point to the interplay of health issues, cultural norms, and personal discomfort in determining breastfeeding behavior (Tampah-Naah et al., 2019).

Additionally, some participants noted that cultural beliefs around water or artificial feed introduction, heavy domestic workloads, and limited maternity leave further complicate EBF. These social and environmental factors often leave mothers feeling compelled to supplement breastmilk before the recommended six-month period. Similar trends have been observed in other Ghanaian research, suggesting that even in settings where mothers understand the benefits of EBF, systemic and cultural obstacles can undermine its practice (Diji et al., 2017. Addressing these constraints will require a multipronged approach—one that combines improved clinical support (e.g., lactation counseling, postpartum follow-ups) with broader structural reforms, such as extending maternity leave policies and creating more breastfeeding-friendly environments.

The study also examined maternal factors influencing EBF. Results showed that maternal age, educational status, employment status, parity, and mode of delivery were significantly associated with EBF practices. These findings underscore that while knowledge is necessary, personal and demographic characteristics often shape whether that knowledge is acted upon. Women who are older or more educated may feel more confident in their ability to breastfeed and be more aware of its benefits. In contrast, younger or less educated mothers might require additional counseling and support to initiate and maintain EBF. Meanwhile, the lack of association with marital status, monthly income, or HIV status suggests that these variables may be less influential in this specific context, though they have been reported as important in other studies.

Taken together, the results highlight the complexity of sustaining EBF in real-world settings. While knowledge is a critical first step, successful practice often depends on overcoming practical, cultural, and personal barriers. Strengthening postnatal care services—particularly lactation counseling and peer support networks—could further encourage mothers to persist with EBF despite the challenges they encounter.

CONCLUSION

Exclusive breastfeeding is integral to promoting infant growth, nutritional well-being, and reducing the risk of infant mortality. The present study affirms that nursing mothers at Tamale West Hospital

generally have a good understanding of EBF, yet they face significant constraints such as insufficient breastmilk production, physical discomfort, and sociocultural pressures. Addressing these barriers will require coordinated efforts by healthcare providers, policymakers, and community stakeholders. Strategies that enhance postpartum support, extend maternity leave, and normalize public breastfeeding could help mitigate the physical and social obstacles identified in this research. The strong association of EBF with maternal age, educational level, employment status, parity, and mode of delivery points to the need for tailored interventions. Health education programs, workplace policies, and culturally sensitive outreach initiatives should focus on these demographic groups to maximize EBF uptake. By addressing both individual-level factors and structural barriers, public health efforts can strengthen exclusive breastfeeding practices, ultimately improving maternal and infant health outcomes. Future research may explore interventions that specifically target the most frequently cited challenges and assess their effectiveness in different socio-cultural settings.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Ghana Health Service Ethics Review Committee. Informed consent was obtained from all subjects and their legal guardians. Participants could withdraw at any time. Participation was voluntary and confidential, with unique IDs ensuring anonymity.

Consent for publication

Not applicable

Data Sharing

Aside data gathered during this study, no external datasets were analyzed or utilized.

Competing interests

The authors declare no competing interests.

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Author Contribution

A.N.G and P.O.A. designed the study. S.A.A. led data acquisition and analysis. E.K.S., P.O.A., A.N.G., and F.A. interpreted the data, wrote, and edited the manuscript. All authors reviewed and approved the manuscript.

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Data Availability

The datasets generated and analyzed in this current study are available upon request to the corresponding author.

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