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Neonatal Care Practices Among Post-Natal Mothers in Ghana: A Multi-Centre Study

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Abstract

Introduction: Neonatal care is a series of specialized care provided to newborns aimed at ensuring the health and well-being of newborns. This study aimed at assessing neonatal care practices among post-natal mothers in the Obuasi municipality of Ghana.

Methods: An institution-based descriptive cross-sectional study was carried out on 423 post-natal mothers. A structured questionnaire was administered through an interview. A multivariate logistic regression model was set up to determine independent predictors of neonatal care practices among post-natal mothers.

Results: The study revealed that 67.1% of mothers had knowledge on safe cord care, 83.9% had good breastfeeding practices and all the respondents had good knowledge on danger signs recognition among newborns. Regarding overall neonatal care practice, 56.7% had good neonatal care practice. Age (AOR: 3.10, 95% CI: 0.84 – 12.10, P-value: 0.038), educational status (AOR: 5.23, 95% CI: 1.23 – 17.55, P-value: 0.028), antenatal clinic visits for last pregnancy (AOR: 4.21, 95% CI: 1.27 – 12.44, P-value: 0.005), number of antenatal clinic visits (AOR: 4.36, 95% CI: 1.32 – 14.10, P-value: 0.041) and place of delivery (AOR: 6.21, 95% CI: 1.17 – 12.05, P-value: 0.013) were the maternal characteristics found to be significantly associated with good neonatal care practice.

Conclusion: In this study, neonatal care practice among post-natal mothers was fairly good. Concerted strategies are required to improve neonatal care practices among post-natal mothers.

Keywords: Neonatal care; Cord care; Breastfeeding practices; Post-natal mothers; Ghana

1. Introduction

The initial seven days of an infant's existence are pivotal for their development. During this time, it is imperative for the infant to quickly and effectively adjust to life outside the womb, a transition highlighted by Tran et al (1) as being fraught with challenges. The likelihood of mortality is notably high within the first 24 to 48 hours post-delivery, underscoring the importance of the care received during this period. Newborns have nine fundamental needs that must be met to ensure their wellbeing. These include ensuring the airway is unobstructed, breathing is stable, the infant remains warm and risks of bleeding and infections are minimized (2). Additionally, the need for proper identification, monitoring, adequate nutrition, hydration, emotional bonding with parents and sufficient rest are emphasized by Alemu and Eshete (3) as essential for healthy development.

Proper care for newborns encompasses several critical practices. These involve starting breastfeeding early and ensuring it is the only source of nutrition, regulating the infant's temperature through immediate drying, encouraging

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skin-to-skin contact, postponing baths and implementing a "warm chain". Moreover, maintaining cleanliness such as proper care of the umbilical cord and ensuring caregivers wash their hands thoroughly is also vital for the newborn's health. There is good evidence that adherence to these recommended practices substantially reduces mortality risk, especially for very small newborns (4). Health service contacts during antenatal care and post-natal care are important opportunities to influence these practices. Promotion of essential newborn care practices is one strategy for improving newborn health outcomes. Neonatal care includes immunization against tetanus, preparation of mothers for managing complications, ANC follow-up, skilled care of mothers like thermal care, cord care, breastfeeding and bathing of neonates (5).

Essential newborn care (ENBC) is a set of recommendations designed to improve the newborn's health through interventions during pre-conception, pregnancy and the postnatal period. In settings where a majority of births take place at home without a skilled attendant, essential newborn care are promoted at the community level (6). For example, promotion of preventive behaviours through home visits by community health workers has shown to improve key newborn care practices (7). To reduce childhood deaths, the Integrated Management of Childhood Illnesses (IMCI) strategy was developed by World Health Organization and United Nations Children's Fund (8). Integrated Management of Neonatal and Childhood Illnesses (IMNCI) is the Indian version of Integrated Management of Childhood Illnesses strategy. INMCI gives central thrust to the neonatal care component, as neonatal mortality now accounts for two-thirds of infant mortality. Integrated Management of Childhood Illnesses is a three-pronged strategy. Its three main components are improving the case management skills of the health workers, improving the health system supports to ensure quality care to the children presenting at such facilities or outreach sites and improving household and community practices related to child health, nutrition and development (9).

Neonates often present with non-specific symptoms and signs of severe illness. 'Danger signs' are the signs presented in a neonate for cases of serious bacterial infection, severe jaundice, diarrhea with dehydration or severe persistent diarrhea (10). Neonatal danger signs signify the presence of clinical signs that could indicate high-risk of neonatal morbidity and mortality. They are also an indication for early therapeutic intervention (11). According to World Health Organization, danger signs for a neonate include high-grade fever, fast breathing, hypothermia and severe chest indrawing (12). Convulsion, unconsciousness, jaundice in the first 24 hours (involving the palm and sole), lethargy, umbilical redness or pus drainage and inability to feed are other danger signs (13). Other studies report that diarrhea and pus drainage from the eye are considered as neonatal danger signs.

The World Health Organization and United Nations Children's Fund developed a list of '16 Key Family Practices' to define and streamline the third component of the Integrated Management of Childhood Illnesses strategy. This list of practices was divided into four major groups: practices for physical growth and mental development, practices for disease prevention, practices for appropriate home care and practices for seeking care (14).

Care of the umbilical cord is always emphasized since the cord area promotes the growth of some harmful microorganisms and can function as an entry point for infections (15). Good cord care is affected by the presence and prevalence of risky practices such as application of oils, powder and cow dung on the umbilical cord stump. Mothers apply substances to the cord for several reasons, including preventing infection and "help the cord heal fast" so that they can go back to their domestic chores. Yet all these highly exposes newborns to the risk of infections, sepsis and significantly contribute to neonatal morbidity and mortality (16). Apart from postnatal visits to the health facility, health workers are unable to follow up and observe all neonatal care practices of mothers during the postnatal period.

Globally, approximately 7.7 million under five mortalities occur each year, out of which approximately 3.1 million occur among newborns during the neonatal period, accounting for 45% (8). Gonfa et al (17) found that more than one-third of these deaths take place in the first 24 hours of birth, whereas three-quarter of the neonatal deaths takes place in the first seven days of birth. In Ghana, neonatal mortality rate was reported to be 22.9 deaths per 1000 live births in 2020 (18). The Ghana Health Service estimates that neonatal death accounts for 47% of all deaths in under-five children (19). Although globally, there has been a considerable decline in infant mortality in the last decade, mortality rates remain unchanged especially in developing countries such as Ghana.

According to the GHS, neonatal mortality rate was reported to be 22.2 deaths per 1000 live births in 2020, 21.6 deaths per 1000 live births in 2021 and 21.1 deaths per 1000 live births in 2022 (20).

In the Obuasi Municipality of Ghana, a report on the three-year trend in neonatal mortality rates indicated a decrease from 1.4 in 2020 to 0 in 2021. However, there was a marginal increase to 1.2 in the year 2022 (21). The recorded neonatal deaths were due to bacterial sepsis of the newborn, birth asphyxia and perinatal respiratory disorders in prematurity. Evidence shows that commonest primary causes of neonatal deaths such as severe infections, birth

asphyxia and injuries, tetanus and diarrhea are contributed by care practices immediately following delivery of newborn (3). Despite implementation of proven cost-effective solutions such as promoting immunization, skilled attendance during delivery, health education on immediate and exclusive breast-feeding and clean cord care, there has been relatively little change in neonatal morbidity rates (22).

2. Materials and methods

2.1. Study area and period

The study was conducted in the Obuasi Municipality from 1st December 2023 to 1st February 2024. The Obuasi municipality is located in the Southern part of the Ashanti Region of Ghana and has four sub-municipalities.

2.2. Study design

An institution-based descriptive cross-sectional survey design was adopted to access neonatal care practices among post-natal mothers in the Obuasi municipality.

2.3. Study population

The study was conducted among post-partum mothers residing within the Obuasi Municipality of Ghana. The eligibility criteria were mothers with babies less than 6 weeks old and consented to the study, mothers between age 15 and 49 years and resident at least for 6 months in the catchment area prior to the time of data collection. Mothers who were unable to communicate because of serious illness or impaired cognition or known mental illnesses and mothers who had babies with gross congenital malformation, preterm births and severe maternal or neonatal conditions were excluded from the study.

2.4. Sample size and sampling techniques

The sample size for the study was determine using the standard Cochran formula given as follows:

$$n = \frac{Z^2 \times p\ (1-p)}{e^2}$$

Where n= sample size to be determined

e = is the desired precision level (margin of error) =5% (0.05)

p = proportion of the population, conventionally estimated at 0.5.

Z = Z-score of 1.96 at 95% confidence level

Sample size was calculated as:

$$n = \frac{(1.96)^2(\ 0.5) \times (1-0.5)^2}{(0.05)^2}$$

$$n = \frac{(1.96)^2(0.5) \times (0.5)}{0.0025}$$

n = 385

Adjusting for a 10% non-response rate gives 0.1× 385= 38. Therefore, the desired sample size for the study was 385 + 38 = **423**.

This study employed a multistage sampling method. All four sub-municipalities within the municipality were selected for the study. This study utilized a multistage sampling approach. The study encompassed all four sub-municipalities within the larger municipality. A proportionate sampling technique was employed to distribute the sample size across each sub-municipality in accordance with their respective population sizes. The sample size for each sub-municipality was determined by considering the population of women in fertility age (WIFA) within that sub-municipality relative to the total WIFA population of the entire municipality. To select the participating facilities from each sub-municipality, a simple random sampling method was implemented. The same proportionate sampling strategy was applied to

determine the number of participants to be sampled from each facility. Once the number of participants allocated to each facility was established, a systematic sampling technique was utilized to select individuals within those facilities. The sampling interval (k) was calculated using the formula $\frac{N}{n}$ where;

N = the total number of eligible participants in each facility
n = the estimated sample size.
The overall population (N) was divided by the sample size (n) to determine the sampling interval, denoted as k. The initial participant at each post-natal clinic was chosen randomly through a balloting process. Subsequently, every k^{th} patient was selected and invited to take part in the study. This procedure continued until the desired sample size was reached. In instances where an individual opted out of participation, the subsequent k^{th} individual was chosen instead.

2.5. Data collection instrument and data collection technique

A semi-structured, pre-tested questionnaire served as the instrument for data collection. Researchers alongside trained data collectors conducted data collection across different communities. Data collectors underwent comprehensive training covering the study protocol, ethical considerations and measures for ensuring data quality. While the questionnaire was designed for self-administration in English, questions were verbally presented to respondents who were unable to read.

2.6. Statistical analysis

Data cleaning was done using Microsoft Excel and then imported into SPSS version 25 for analysis. Only data from respondents who completed all items of the survey were included in the data analysis. Descriptive statistics was computed to summarize respondents' self-reported sociodemographic characteristics. Multivariate logistic regression analysis was conducted to establish associations. Variables with p-value < 0.05 were declared to have significant association with outcome variable.

2.7. Ethical consideration

Ethical clearance was sought from the Ghana Health Service Ethics Review Committee before the commencement of the study. Permission was sought from the Municipal Director of Health Services and various heads of facility. Written consent was obtained from each participant before being included in the study. All information collected from the survey were kept confidential and safe. The anonymity and confidentiality of participants were ensured by assigned numerical codes instead of names without any personal identifiers in the data collection, analysis and the findings. Participation was voluntary and based on participants willingness and had the right to withdraw from the study at any point.

3. Results

3.1. Socio-demographic characteristics

A total of 423 post-natal mothers were surveyed giving a response rate of 100%. They were drawn from the four sub-municipals of the Obuasi Municipality. Out of this, majority were between the ages of 26 – 30 years old. The mean age was 31.4 years (SD: ±6.81). Majority (273, 64.5%) of respondents were married with one-fifth being single. A significant proportion (60.3%) of respondents lived in rural settlements. Two-thirds (291, 68.8%) of the respondents were Akans (Asante and Fante) with 33 (7.8%) belonging to other tribes such as Dagomba, Mamprusi, Sisala, Dagarti and Frafra. Nearly half (46.3%) of respondents had Senior High School education with 9.0% (38) being graduate degree holders. Majority (77.8%) of the surveyed participants were Christians. A significant number of respondents (352, 83.2%) were gainfully employed with majority (36.4%) being self-employed. One-sixth (67,15.8%) of respondents were uniparous with the rest being multiparous. (Table 1).

Table 1 Socio-demographic data of respondents, Obuasi municipality, Ghana, 2023 (n=423)

Variable	Frequency	Percentage (%)
Sub-municipals		
Anyinam	85	20.1
Gausu	118	27.9

Kunka	93	22.0
New Nsuta	127	30.0
Age (years)		
15-20	14	3.3
21-25	59	13.9
26-30	133	31.4
31- 35	108	25.5
36-40	68	16.1
>40	41	9.7
Marital status		
Married	273	64.5
Cohabiting	50	11.8
Single	89	21.0
Divorced	11	2.6
Place of residence		
Rural	255	60.3
Urban	168	39.7
Ethnic group		
Asante	274	64.8
Ga	53	12.5
Ewe	46	10.9
Fante	17	4.0
Others	33	7.8
Educational status		
Basic education	73	17.3
Senior High level	196	46.3
Diploma certificate	73	17.3
Undergraduate degree	35	8.3
Graduate degree	38	9.0
Others	8	1.9
Religion		
Christian	329	77.8
Islam	77	18.2
Traditionalist	13	3.1
Others	4	0.9
Employment status		
Yes	352	83.2
No	71	16.8

Type of employment (n=352)		
Civil service worker	92	21.7
Self-employed	154	36.4
Farmer	76	18.0
Others	30	7.1
Number of children		
One	67	15.8
Two	178	42.1
Three	129	30.5
Four and above	49	11.6
Age of last child (in weeks)		
1 week	69	16.3
2 weeks	91	21.5
3 weeks	109	25.8
4 weeks	80	18.9
5 weeks	74	17.5

3.2. Obstetric characteristics of respondents

Majority (96.4%) of respondents attended antenatal clinic in their last pregnancy with more than half (348, 82.3%) of them attending four or more ANC sessions. A greater portion (91.3%, 76.8% and 85.6%) of respondents received education on breastfeeding practices, umbilical cord care and danger signs respectively during their ANC appointments. Seventy-four percent (74.0%) of post-natal mothers surveyed received education from health workers with 5.7% (24) educated by relatives. Up to 54.8% (232) of respondents delivered at a hospital with a majority (350, 82.7%) delivered through spontaneous vaginal delivery.

Table 2 Obstetric characteristics of respondents, Obuasi municipality, Ghana, 2023 (n=423)

Variable	Frequency	Percentage (%)
ANC visit for last pregnancy		
Yes	408	96.4
No	15	3.6
Number of ANC visit (n=408)		
Less than 4	60	14.2
Four and above	348	82.3
Education on breastfeeding practices		
Yes	386	91.3
No	37	8.7
Education on umbilical cord care		
Yes	325	76.8
No	98	23.2
Education on danger signs		

Yes	362	85.6
No	61	14.4
Educator		
Health worker	313	74.0
TBA	9	2.1
Friends	18	4.3
Relatives	24	5.7
Others	3	0.7
Place of delivery		
Hospital	232	54.8
Health centre	155	36.6
Home/TBA	34	8.0
Others	2	0.5
Mode of delivery		
Caesarean section	60	14.2
Vaginal delivery	350	82.7
Vacuum	13	3.1

ANC: Antenatal clinic; TBA: traditional birth attendant

3.3. Post-natal mother's neonatal care practices

A significant majority of respondents (259, 61.2%) indicated that the preferred practice for newborn cord care is to refrain from applying any substances to the cord. In contrast, 10.4% (44) of participants recommended cleaning the cord with boiled cooled water. Notably, 88.2% (373) of the respondents recognized the potential dangers associated with inadequate newborn cord care practices. When prompted to identify these risks, 64.1% (271) cited infections as a significant concern while 3.5% (15) mentioned the possibility of infant mortality. Furthermore, an overwhelming 94.3% of respondents acknowledged the importance of proper cord care in promoting infant health. Among the study participants, a majority (284, 67.1%) reported that they did not apply any substances to their babies' umbilical cords. Among those who did use substances, 9.2% utilized local herbs, 6.1% used ash and 1.2% applied various other substances.

A substantial majority of mothers (382, 90.3%) reported that a newborn should be breastfed within one hour of birth or immediately thereafter. Additionally, over two-thirds of the participants (361, 85.3%) provided colostrum to their infants. Among those who did not administer colostrum, 6.1% (26) cited the appearance of colostrum as being unclean, while 3.9% (16) mentioned receiving advice against its use. When inquired about the timing of the first breastfeeding, 64.3% (272) of mothers indicated that they initiated breastfeeding within 30 minutes to one hour post-delivery. A notable proportion of participants (350, 82.7%) reported that breast milk was the first feed given to their babies, whereas 5% (21) opted for glucose as the initial feed. Furthermore, more than half of the respondents (217, 51.3%) did not practice exclusive breastfeeding.

In terms of recognizing danger signs, all participants in the study successfully identified a minimum of three danger signs in neonates. The respondents noted high temperature or the baby feeling excessively warm (19.2%), convulsions or fits (13.5%), inability to breastfeed (11.8%) and jaundice (10.9%) as significant danger signs in neonates. A substantial majority of post-natal mothers (407, 96.2%) reported that they seek medical attention at a hospital upon observing any danger signs in their child or neonate, while only 0.5% opted to purchase medications from local chemical shops for their child.

Table 3 New-born cord care practices among post-natal mothers in Obuasi municipality, Ghana, 2023 (n=423)

Variable	Frequency	Percentage (%)
What is the recommended new-born cord care practices		
Clean the cord with boiled cooled water	44	10.4
Don't use soap	28	6.6
Use separate utensils	23	5.4
Don't apply any substance on the cord	259	61.2
Dry cord before dressing up the child	27	6.4
Others	42	9.9
Are you aware of any risks of poor new-born cord care practices		
Yes	373	88.2
No	50	11.8
Mention the risks of poor new-born cord care practices		
Infections	271	64.1
Bleeding	58	13.7
Death	15	3.5
Others	29	6.9
Good cord care is important in maintaining the health of the baby		
Yes	399	94.3
No	24	5.7
How many times do you clean the umbilical cord per day?		
Once	25	5.9
Twice	247	58.4
Thrice	103	24.3
Others	48	11.3
Did you put anything on the umbilical cord before it fell off?		
Yes	139	32.9
No	284	67.1
What substances did you apply on the baby's cord (n=139)		
Cow dung	7	1.7
Coconut oil	17	4.0
Ash	26	6.1
Tooth paste	16	3.8
Salt water	17	4.0
Soil	2	0.5
Local herbs	39	9.2
Mustard oil/turmeric	10	2.4

Others	5	1.2
Cultural importance of applying substances on the new-born's cord.		
To help it dry faster	52	12.3
To prevent infections	55	13.0
To meet cultural obligations	27	6.4
Others	5	1.2

Table 4 Breastfeeding practices among post-natal mothers in Obuasi municipality, Ghana, 2023 (n=423)

Variable	**Frequency**	**Percentage (%)**
When is a new-born supposed to be breastfed?		
Within 1 hour of birth/ immediately after birth	382	90.3
Others	41	9.7
Did you give colostrum?		
Yes	361	85.3
No	62	14.7
Why did you not give colostrum (n=62)		
Looked dirty	26	6.1
Taboo	20	4.7
Advised against it	16	3.9
How long after delivery did you first breastfed your baby?		
Within 30 minutes	83	19.6
30 minutes to 1 hour	272	64.3
2 hours	30	7.1
6 hours	7	1.7
After 24hours	24	5.7
Whenever baby cries	7	1.7
What was the first feed you gave?		
Breast milk	350	82.7
Formula	23	5.4
Water	26	6.1
Glucose	21	5.0
Others	3	0.7
If baby was breastfed after 24 hrs, why did you take that long to breastfeed (n=24)		
No breast milk	10	2.4
Did not know how to breast feed	3	0.7
Was giving other feeds	6	1.4

Baby wasn't crying	2	0.5
Do not know	3	0.7
Did you exclusively breastfeed throughout the first six months		
Yes	206	48.7
No	217	51.3
What additional food did you give to your current baby after birth (n= 217)		
Water	52	12.3
Honey	31	7.3
Cow milk	24	5.7
Infant formula	97	23.0
Butter	9	2.1
Others	4	0.9
Did you use bottle feeding for your baby		
Yes	83	19.6
No	340	80.4
Why did you use bottle feeding (n=83)		
My mum recommended	3	0.7
Easy feeding	35	8.3
It is simple	3	0.7
Makes baby comfortable	8	1.9
Busy work schedules	1	0.2
Allows me to work freely	19	4.5
Health issues	2	0.5
No reason	12	2.8

Table 5 Danger signs mentioned by post-natal mothers in Obuasi municipality, Ghana, 2023

Variable	**Frequency**	**Percentage (%)**
Danger signs		
Very small baby	76	5.1
Smelly/reddish umbilical cord	104	7.0
Skin pustules	58	3.9
Red, swollen eyelids/pus discharge from eyes	95	6.4
Baby grunting	58	3.9
Baby crying too much	94	6.3
Unable to breastfeed	175	11.8
Yellowing of the baby	162	10.9
Baby is too hot (fever)	285	19.2

Baby is too cold	69	4.6
Poor cry from baby	53	3.6
Too sleepy/difficult to wake	55	3.7
Convulsion/fit	200	13.5

Multiple response

3.4. Neonatal care practice among post-natal mothers

In the assessment of effective neonatal care practices, three composite variables were established: safe cord care (characterized by the absence of any substance applied to the umbilical cord), optimal breastfeeding practices (defined as the initiation of breastfeeding within the first hour post-delivery and the provision of colostrum to the infant), and adequate knowledge of danger sign recognition (measured by the mother's capacity to identify at least three danger signs in neonates). These composite variables were subsequently categorized into two groups: Yes (indicating the presence of all practices) or No (indicating the absence of one or more practices). In terms of overall neonatal care practices, 240 individuals (56.7%) demonstrated good practices, while 183 individuals (43.3%) exhibited poor practices.

Table 6 Composite measures of Neonatal care practices among post-natal mothers in Obuasi municipality, Ghana, 2023 (n=423)

Variable	Frequency	Percentage (%)
Safe cord care		
Yes	284	67.1
No	139	32.9
Good breastfeeding practices		
Yes	355	83.9
No	68	16.1
Good knowledge on danger sign recognition		
Yes	423	100
No	0	0.0

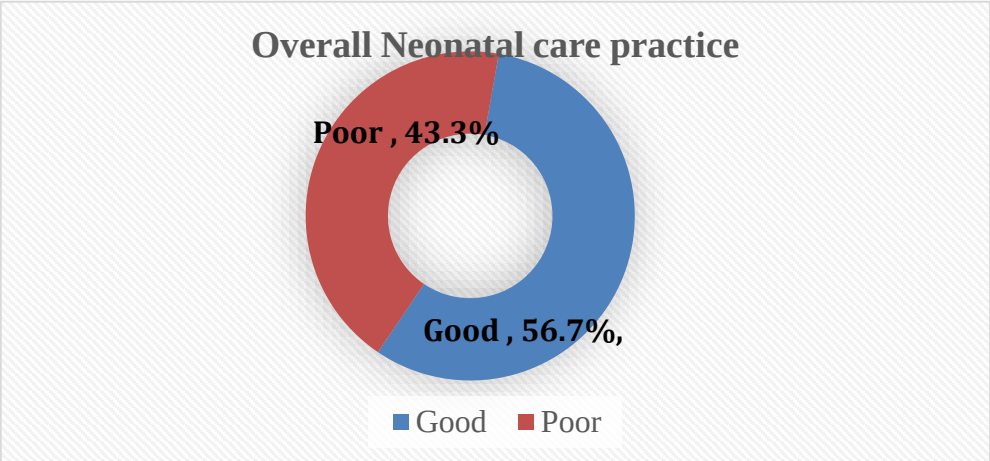

Figure 1 Overall Neonatal care practice among post-natal mothers in Obuasi municipality, Ghana, 2023 (n=423)

3.5 Determinants of newborn care practices among postnatal mothers

In the multiple logistic regression analysis, mothers in the age group of 26 - 30 years exhibited a threefold increased likelihood of demonstrating effective neonatal care practices when compared to mothers aged 15-20 years (AOR: 3.10, 95% CI: 0.84 - 12.10). Mothers possessing undergraduate degrees exhibited a 5.23-fold increased likelihood of engaging in effective neonatal care practices when compared to those with only basic education (AOR: 5.23, 95% CI: 1.23 – 17.55). Mothers who attended Antenatal clinic in their previous pregnancies where 4.21 times likely to have good neonatal care practices compared to those who did not attend any (AOR: 4.21, 95% CI: 1.27 – 12.44). Mothers who attended four or more antenatal care (ANC) visits in their previous pregnancies were found to be 4.36 times more likely to engage in good neonatal care practices compared to those who did not attend any ANC visits (AOR: 4.36, 95% CI: 1.32 – 14.10) (Table 8).

Table 7 Bivariate and multivariate logistic regression analysis of factors associated with neonatal care practice, Obuasi municipality, Ghana, 2023 (n=423)

Variable	Neonatal care practice n (%)		Crude Odds ratio	P-value	95% Confidence interval	Adjusted Odds ratio	P-value	95% Confidence interval
	Good Poor (n=240) (n= 183)							
Age								
15-20 (base)	4 (28.6)	10 (71.4)	1					
21-25	31 (52.5)	28 (47.5)	0.92	0.195	0.64 – 8.84	1.68	0.770	0.53 – 5.71
26-30	77 (57.9)	56 (42.1)	2.38	0.010	0.40 – 1.91	3.10	0.038	0.84 – 12.10
31- 35	72 (66.7)	36 (108)	1.95	0.306	0.69 – 3.12	1.22	0.593	0.26 – 4.43
36-40	36 (52.9)	32 (47.1)	1.30	0.047	0.35 – 5.10	0.89	0.117	0.10 – 2.39
>40	20 (48.8)	21 (51.2)	2.01	0.674	0.53 – 11.29	0.93	0.570	0.37 – 3.50
Educational status								
Basic education (base)	44 (60.3)	26 (39.7)	1					
Senior education	123 (62.8)	73 (37.2)	1.36	0.234	0.82 – 2.26	0.95	0.866	0.43 – 1.86
Diploma certificate	28 (38.4)	45 (61.6)	2.07	0.381	1.11 – 4.42	1.63	0.301	0.22 – 3.19
Undergraduate degree	18 (51.4)	17 (48.6)	2.56	0.015	1.19 – 5.68	5.23	0.028	1.23 – 17.55
Graduate degree	26 (68.4)	12 (31.6)	3.22	0.023	1.10 – 11.30	2.40	0.302	0.99 – 5.33
Others	1 (12.5)	7 (87.5)	1.33	0.481	0.95 – 3.34	0.88	0.518	0.27 – 1.88
Number of ANC visits								
No visit (base)	1 (6.7)	14 (93.3)	1					
Less than 4 visits	30 (50.0)	30 (50.0)	2.23	0.146	0.87 – 4.10	1.56	0.268	0.33 – 5.07
More than 4 visits	209 (60.1)	139 (39.9)	3.05	0.003	1.34 – 6.35	4.36	0.041	1.32 – 14.10
Educator								
No education (base)	23 (41.1)	33 (58.9)	1					
Health worker	203 (64.9)	110 (35.1)	3.21	0.018	1.23 – 6.85	2.21	0.276	0.53 – 9.17
TBA	3 (33.3)	6 (66.7)	1.21	0.301	0.26 – 2.98	1.83	0.431	0.32 – 4.62
Friends	2 (11.1)	16 (88.9)	1.55	0.124	0.62 – 4.76	1.28	0.309	0.28 – 2.19
Relatives	8 (33.3)	16 (66.7)	1.43	0.663	0.35 – 5.22	0.97	0.637	0.17 – 7.12

Others	1 (33.3)	2 (66.7)	0.92	0.125	0.42 – 2.53	0.81	0.290	0.14 – 1.56
Number of children								
One (base)	42 (62.7)	25 (37.3)	1					
Two	107 (60.1)	71 (39.9)	2.48	0.266	0.44 – 6.32	1.13	0.305	0.40 – 2.03
Three	66 (51.2)	63 (48.8)	3.10	0.031	1.05 – 8.32	2.22	0.880	0.72 – 3.13
Four and above	25 (51.0)	24 (49.0)	2.21	0.320	0.89 – 3.36	1.42	0.936	0.60 – 2.75
ANC visit for last pregnancy								
No (base)	1 (6.7)	14 (93.3)	1					
Yes	239 (58.7)	169 (41.4)	2.61	0.009	0.92 – 3.67	4.21	0.005	1.27 – 12.44
Place of delivery								
Home/TBA (base)	12 (35.2)	22 (64.7)	1					
Hospital	139 (59.9)	93 (40.1)	3.09	0.004	1.56 – 6.09	6.21	0.013	1.17 – 12.05
Health centre	87 (56.1)	68 (43.9)	2.02	0.111	0.74 – 3.81	1.84	0.106	0. 24 – 3.08
Others	2 (100)	0 (0.0)	0.91	0.202	0.33 – 2.45	0.70	0.308	0.24 – 1.98
Mode of delivery								
Vacuum (base)	0 (0.0)	13 (100)	1					
Caesarean section	32 (53.3)	28 (46.7)	3.71	0.031	1.13 – 9.33	2.10	0.464	0.27 – 6.12
Vaginal delivery	208 (59.4)	142 (40.6)	1.89	0.442	0.22 – 4.15	1.46	0.214	0.42 - 3.58

4. Discussion

The World Health Organization recommends dry cord care and if it becomes necessary to apply anything at all, it should be chlorhexidine digluconate (23). The use of unconventional remedies or substances on the umbilical cord of newborns predisposes them to infections and ultimately newborn mortality. The findings from this study indicates that 67.1% of respondents possess knowledge regarding safe cord care. This present finding is higher than what was reported in a study conducted in South-west Ethiopia where 18.3% of respondents demonstrated knowledge on safe cord care (24). The reason for this difference may be attributed to cross-cultural variations and differences in study settings. Similarly, this study's finding surpass that of a study conducted at the Yaoundé Teaching Hospital in Cameroon, which reported that only 18.2% of respondents had adequate knowledge of safe cord care (25).

The current findings surpass those reported in studies from Ethiopia and Tanzania. Specifically, the Ethiopian study indicated that 31% of adolescent mothers possessed knowledge regarding safe cord care (26). Similarly, the Tanzanian study revealed that 56.9% of post-natal mothers were aware of safe practices for newborn cord care (27). The observed discrepancies may stem from variations in study environments and potential cultural differences. Conversely, the results of this study were lower than those from Nigerian study, which found that 73.8% of post-natal mothers had knowledge of safe cord care (28). This variation may also be linked to differences in the study contexts.

Additionally, this study revealed that 32.9% of mothers applied substances to the umbilical cord prior to its detachment. The majority, accounting for 9.2%, utilized local herbs, while 6.1% used ash, 4% employed coconut oil and 3.8% applied toothpaste. This finding aligns with a Nigerian study (29), which documented the use of ointments, ghee, coconut oil, mustard oil, surma, clove oil and talcum powder on the umbilical cord. Again, this observation is consistent with several studies conducted in Tanzania (30), Western Uganda (31) and Uganda (32) which reported the application of potentially harmful substances such as salty water, local herbs, talcum powder, lizard droppings, powdered materials from local trees and butter on newborns' umbilical cords.

Optimal breastfeeding plays a crucial role in the growth and development of infants, particularly in newborns. It serves as the principal source of nutrition during this early stage of life (33). The World Health Organization (WHO) recommends that infants should be exclusively breastfed for the first six months. The present investigation revealed

that 83.9% of post-natal mothers exhibited commendable breastfeeding practices. Additionally, it was observed that a significant majority (90.3%) of mothers commenced breastfeeding within one hour or immediately following childbirth. This rate surpasses the findings of Cohen et al. (34), which indicated that only 60% of adolescent mothers initiated breastfeeding within the same timeframe. This variation may be linked to the place of delivery. In the current study, most post-natal mothers delivered at healthcare facilities (hospitals and health centres), which likely provided them with access to knowledge and supervised postnatal care from healthcare professionals. This outcome surpasses the findings of a study conducted in Finland, which reported that 32.6% of mothers initiated breastfeeding within the first hour post-delivery (35). The present study also found that 14.7% of respondents did not give colostrum and 17.3% also gave other feeds other than breastmilk to their newborns. These results align with the observations made by Nguyen et al (36) who noted that some mothers discarded colostrum in favour of pre-lacteal feeds such as infant formula, honey, plain water, sugar or salt solutions and diluted cow milk.

Regarding exclusive breastfeeding, the current study found that 48.7% of respondents exclusively breastfed their newborns for the first six months. This finding contrasts with the results of Kokebie et al (37) which reported that only 10% of mothers maintained exclusive breastfeeding for the same duration. The discrepancy in these findings may be attributed to the fact that a significant proportion of mothers in this study attended multiple antenatal clinic visits (four or more), thereby receiving more comprehensive education on breastfeeding practices compared to the Ethiopian study, where only 8.5% of respondents had similar levels of antenatal care during their previous pregnancies.

In terms of recognizing danger signs, all participants in the study successfully identified a minimum of three danger signs in neonates, resulting in a perfect score of 100% for knowledge regarding danger sign recognition among post-natal mothers. This outcome surpasses the findings reported in studies conducted in Sudan, Tanzania and Kenya. The Sudanese study reported that 36.5% of mothers demonstrated a strong understanding of danger signs recognition (38) whilst the Tanzanian study revealed that 35% of post-natal mothers possessed adequate knowledge regarding danger signs in newborns (39). The Kenyan study also reported similar findings where 36.5% of mothers were knowledgeable about recognizing neonatal danger signs (40). Variations in findings may be attributed to differences in study environments, socio-cultural factors and the dissemination of information regarding neonatal danger signs. The present study identified that fever (19.2%), convulsions (13.5%), inability to breastfeed (11.8%), and jaundice (10.9%) were the most frequently recognized danger signs by mothers. This observation aligns with the study conducted by Sandberg et al. (41), which also highlighted fever, difficulty in sucking and diarrhea as prevalent danger signs in neonates.

Furthermore, the analysis revealed that maternal characteristics such as age, educational attainment, attendance at antenatal clinic during the last pregnancy, the number of ANC visits, and the location of delivery were significantly associated with neonatal care practices among postnatal mothers, as determined by multivariate logistic regression analysis. Mothers aged 26 – 30 years were found to be three times more likely to have good neonatal care practice compared to mothers aged 15-20 years (AOR: 3.10, 95% CI: 0.84 -12.10, P-value: 0038). This association was found to be significant. At this age range, many women may have completed higher education, established stable careers and have a better understanding of health and child care. Additionally, they may have access to more resources and support networks available to them which contributes to their ability to provide adequate care for their new-borns. This study revealed that mothers with undergraduate degrees were 5.23 times more likely to have good neonatal care practice compared to their counterparts who had basic education (AOR: 5.23, 95% CI: 1.23 – 17.55, P-value: 0.028). Higher education provides mothers with a deeper understanding of health and child development which enables them make informed decisions regarding neonatal care. Mothers with higher education may have better access to resources including healthcare services and support networks which can positively influence their ability to provide adequate care for their newborns. Findings of this study also revealed that mothers who attended Antenatal clinic in their previous pregnancies where 4.21 times likely to have good neonatal care practice compared to those who did not attend any (AOR: 4.21, 95% CI: 1.27 – 12.44, P-value: 0.005). Antenatal clinics provide expectant mothers with essential information about pregnancy, childbirth and new-born care, empowering them to make informed decisions and adopt healthy practices. Additionally, mothers who attend antenatal clinics receive guidance on breastfeeding, immunization and other important aspects of new-born care which enhances their ability to provide optimal care for new-borns. The current findings demonstrated that mothers who attended four or more ANC appointments during their previous pregnancies were 4.36 times likely to have good neonatal care practice compared to those who attended none (AOR: 4.36, 95% CI: 1.32 – 14.10, P-value: 0.041). Mothers who frequent antenatal care appointments benefit from increased education, monitoring, access to healthcare services and psychological support all of which contribute to better neonatal care practices. Lastly, this study found that mothers who delivered in a hospital were 6.21 times likely to have good neonatal care practice compared to those who delivered at home or by traditional birth attendants (TBA). Mothers who delivered at a hospital are more likely to receive education and supervised neonatal care which ultimately leads to improved care for neonates. Mothers who delivered at home may not benefit from such resources.

5. Conclusion

This study has provided valuable insights into neonatal care practices and the varied practices surrounding neonatal care among post-natal mothers in the Obuasi Municipality of Ghana. The study demonstrated that; there were some shortcomings in safe cord care practices among a section of mothers. These were in the area of applying unconventional substances like cow dung, coconut oil, ash, toothpaste, local herbs and salt water on the umbilical cord of newborns. The breastfeeding practices of some mothers had some gaps, such as initiating breastfeeding after the first hour post-delivery, discarding colostrum and feeding newborns with other feeds like infant formula. Recognition of danger signs among new-borns by mothers was generally good as all mothers surveyed were able to mention at least three danger signs common among newborns. Overall neonatal care practice was fairly good as 56.7% of mothers had good neonatal care practice. Logistic regression analysis showed that age of mothers, educational status, ANC visit during previous pregnancy, number of ANC visits during previous pregnancy and place of delivery were significantly associated with good neonatal care practice. Concerted strategies are required to improve neonatal care practices among post-natal mothers within the Obuasi municipality of Ghana.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no potential conflicts of interest with respect to the authorship and/or publication of this article.

Statement of ethical approval

Ethical approval for this study was obtained from the Ghana Health Service Ethics Review Committee. Ethics approval reference number: GHS-ERC: 063/09/23.

Statement of informed consent

Written informed consent was obtained from all subjects before data collection.

Author contributions

Helena Agyeiwaah Mensah: Conceptualization; Writing-original draft; Writing- review and editing; Samuel Kyeremeh Adjei: Data analysis, Writing-original draft; Writing- review and editing; Emmanuel Tettey Lartey: Data curation; Bryony Brookman-Eshun: Data curation.

Data availability statement

The datasets used and/or analyzed during this study are available from the corresponding author upon reasonable request.

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List of abbreviations

ANC: Antenatal care; AOR: Adjusted odds ratio; CI: Confidence interval; COR: Crude odds ratio; IMNCI: Integrated Management of Neonatal and Childhood Illnesses; MNCH: Maternal, Neonatal and Child Health; NDS: Neonatal danger signs; PNC: Postnatal care; SDG: Sustainable Development Goal; SPSS: Statistical Package for Social Science; TBA: Traditional birth attendant

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