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## Essential Newborn Care Among Postnatal Mothers at Selected Health Centers in Eastern Province, Rwanda

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### ABSTRACT

#### Background

Rwanda's neonatal mortality rate is 20/1000 live births, and the country aims to meet the Sustainable Development Goal of 12 deaths per 1000 live births, or less, by 2030. Countries have decreased newborn deaths, infections, and intensive care unit admissions using the evidenced-based 'Essential Newborn Care' (ENC) guidelines established by the World Health Organization.

#### Objective

To assess postnatal mothers' knowledge and practice of Essential Newborn Care in Kayonza District, Rwanda.

#### Method

A descriptive cross-sectional design was used to assess 192 postnatal mothers at the six-week vaccination services at two health facilities. Data collection using a valid questionnaire occurred from February 28 to March 2, 2019. Data analysis included descriptive and binary logistic regression.

#### Results

The majority (65.1%) had good ENC knowledge and practice, whereas a third (34.9%) had poor knowledge and practice. Significant gaps in ENC included timing of breastfeeding 33(17.2%), cord care 32(16.7%), and thermoregulation of small birth weight newborns 6(3.1%). Significant associations with ENC included maternal age ( $p=0.003$ ), and ENC education postpartum ( $p=0.020$ ).

#### Conclusion

The overall knowledge and practice of ENC are encouraging in this population, particularly with ENC education given postpartum, and older mothers. However, major gaps included evidenced-based cord care, thermoregulation, and breastfeeding, particularly among younger mothers.

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**Keywords:** Essential newborn care, mothers, knowledge, practice, postpartum period

## BACKGROUND

Knowledge of the mother determines what and when essential newborn care (ENC) may be needed, according to a recent study in Kenya. [1] The authors emphasized that ENC information should be given during antenatal care (ANC) and repeated during the postnatal period.[1] Studies have shown that many newborn lives could be saved by the use of simple low technological interventions, such as the ENC guidelines that every newborn need, irrespective of where they are born or their size. The WHO guidelines included four major areas; umbilical cord care (to prevent infection), early initiation and exclusive breastfeeding, thermoregulation measures, and early recognition of danger signs.[2,3]

In Kayonza District, where the study was conducted, the 35% neonatal mortality rate is much higher than in other eastern province districts. The high mortality rate is in line with their low rate of neonatal checkups (2%) in the first two days following birth.[2] The postnatal period is crucial for new mothers to maximize their protective role in the life of the neonate. According to the literature, maternal roles and the magnitude of ENC knowledge and practice are vitally needed. [3]

In Rwanda, the 2015 National Institute of Statistics Rwanda (NISR) reported that 85% of neonatal deaths are the result of prematurity, sepsis, asphyxia, poor management of pregnancy and delivery complications, and poor quality of care immediately following the birth.[4] Many of these neonatal deaths could be prevented if mothers used the evidenced-based ENC guidelines. Mothers who can recognize their newborn's needs could likely prevent many problems and complications through timely ENC intervention.

The literature identifies various studies focusing on ENC knowledge and practice. A recent study conducted in Ethiopia found that 60.2% of mothers had poor ENC knowledge.[5] Authors of a study in Bangladesh found that mothers were knowledgeable about breastfeeding and thermoregulation, yet identified a gap in cord care.[6] Countries that have shown reductions in newborn deaths, infections, and intensive care unit admissions using ENC has encouraged others to follow the WHO evidence-based guidelines.[7] High-income countries, such as America and Europe, have a 90% adherence rate to postnatal care recommendations, whereas only 41% of newborns receive a checkup within two days of birth in SSA.[8,9]

Globally, four million neonates die every year, with nearly one million dying on the first day, and another one million in the following six

days.[8] Eight of the ten countries with the highest neonatal mortality rate are located in sub-Saharan Africa (SSA), with 28 deaths per 1,000 live births.[10] A systematic review of 19 studies in SSA revealed a gap in the literature addressing adherence postpartum care interventions.[10] Research is needed in this particular area to examine what mothers know and practice during this independent postnatal period when most have been discharged home with their newborns from the health facility.

Rwanda's current neonatal mortality rate is 20/1000 live births. The country aims to meet the Sustainable Development Goal of 12 deaths per 1000 live births, or less, by 2030.[2] The Ministry of Health (MOH), and Partners in Health (PIH) scaled-up "All Babies Count" project has occurred in health facilities throughout Rwanda to improve neonatal health outcomes. A recent ENC training of 296 healthcare providers (HCPs) in health centers throughout 10 districts in Rwanda,[11] is another strategy for improving newborn health outcomes in SSA.[12]

In the area of the study, some HCPs affiliated in Rwinkwavu community have received ENC training [4] though currently, data is limited in revealing the existing knowledge and practice of ENC among new mothers. Maternal knowledge and care practices can increase early recognition of neonatal needs and consequently improve outcomes. This study was conducted to assess the existing knowledge and practice of ENC among postnatal women in two health facilities in Kayonza District.

## METHODS

### Design

A descriptive, cross-sectional study design was used to assess the knowledge and practices of ENC among postnatal mothers in two health facilities in Kayonza District in the Eastern Province of Rwanda. The facilities were chosen based on their location (one in semi-urban and one in rural) and their capacity to receive a high volume of women attending vaccination services. The six-week data collection period was from February 28 to March 2, 2019.

### Participants' recruitment

The sampling strategy involved postnatal mothers with term and late preterm newborns who attended vaccination services. Of the 12 sectors in Kayonza District, two were purposively selected, and then two health centers were selected from the two sectors. Based on the sites' records, 190 attended vaccination service a month, and 380 for two

months; 89 at Mukarange Health Center and 101 at Gahini Health Center attended the service during the six-week study period. By using Slovin's formula, a sample size of 195 was obtained. The study excluded postnatal mothers greater than six weeks postpartum, preterm births, and those with severe maternal or neonatal conditions.

### Measures

The investigator merged items from two African research studies; Amolo et al.[1] and Owor et al.[13] Permission was granted from the corresponding authors via email on May 29, 2018 and September 26, 2018, respectively, in order to obtain a single tool related to the objectives. The questionnaire was translated into the Kinyarwanda language. The semi-structured questionnaire consisted of three sections.

Section 1: Sociodemographic characteristics (5 items); age, education, marital status, occupation, and religion. These variables were measured in frequencies

Section 2: WHO components of ENC (26 items) addressed thermoregulation, cord care, breastfeeding, and danger signs. All items were scored with a Yes (1 point) for the correct answer, No (0 points) for the incorrect answer, and Do not know (0 points). These variables were measured as frequencies to indicate levels of knowledge and practice of ENC. The level of knowledge and practice among participants was considered 'good' or 'poor' concerning ENC using the WHO (2018) ENC guidelines. The term 'good' is applied when the participant obtains  $\geq 50\%$ , whereas the term 'poor' is applied when the participant obtains  $< 50\%$

Section 3: Sociodemographic variables, ANC, and histories with ENC (5 items); and ANC history, education on ENC during pregnancy, and after delivery (14 items). The 19 items are presented in frequencies and binary regression analysis to reveal their association with knowledge and practice on ENC

### Data collection

Managers from the two health centers selected two community health workers (CHWs) affiliated with each health center to be involved in the study. The investigator had a training session with the four CHWs in order for them to become research assistants (RAs) prior to data collection. The investigator identified a room for conducting the study and set up dates and times with the RAs. Individual mothers were approached and recruited at the vaccination services from 9 to 12 a.m., depending on the days those services were provided. No compensation was given to the participants. The questionnaire was typically completed in about 20 minutes, and the investigator was responsible for completing and collecting the questionnaires.

### Data analysis

Data were entered into SPSS version 25 checked and cleaned; descriptive and inferential statistics were used to analyze the data. The average of the total score was calculated to obtain the accurate level of knowledge. Binary logistic regression was used to identify the two significant associations in the study population and six other variables that did not meet statistical significance. A p-value of  $< 0.05$  was considered statistically significant.

### Ethical considerations

Approval was obtained from the University of Rwanda, Institutional Review Board (IRB), and the Gahini District Hospital that is responsible for health services in the Kayonza District. All participants were given information about the study and signed the consent form prior to data collection, knowing they could withdraw at any time.

## RESULTS

A total of 192 postnatal mothers completed the questionnaire during vaccination services at two health centers in Kayonza District. The sociodemographic characteristics of the participants are presented in Table 1.

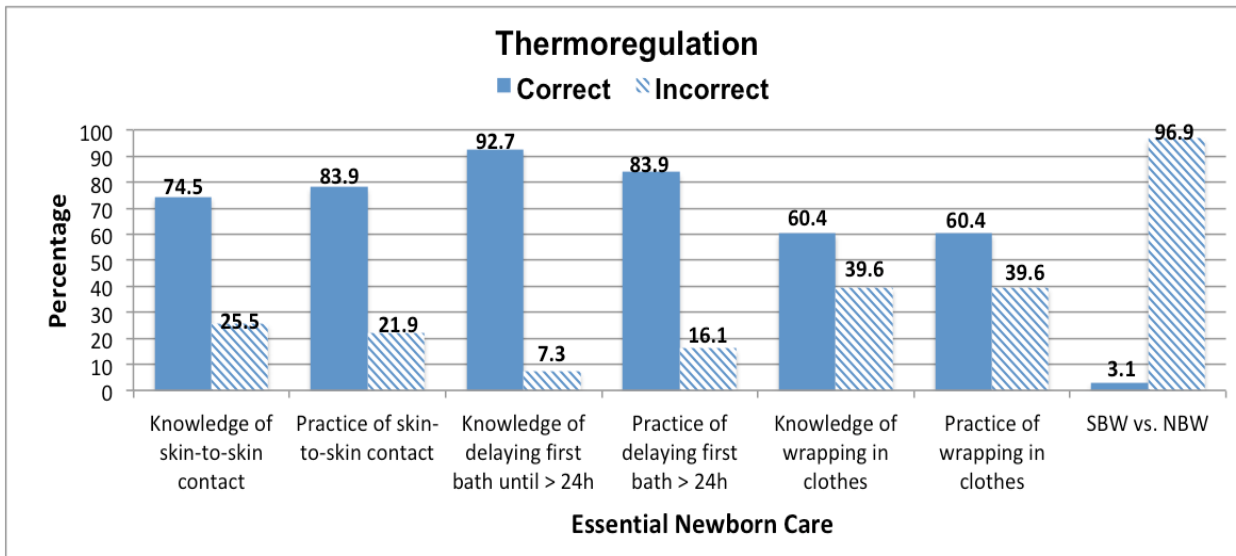
**Table 1. Sociodemographic Characteristics of Mothers (n=192)**

Socio-demographics	n (%)
<b>Age (Years)</b>	
15-20	18 (9.5)
21-25	50 (26.5)
26-30	63 (33.3)
31-35	29 (15.3)
36-40	23 (12.2)
41-45	6 (3.2)
<b>Education</b>	
No formal education	22 (11.5)
Primary dropout	51 (26.7)
Primary	41 (21.5)
Secondary dropout/Vocational	43 (22.5)
Secondary/Vocational	21 (11.0)
Tertiary/University	13 (6.8)
<b>Marital status<sup>^</sup></b>	
Married	169 (88)
Divorced/separated	8 (4.2)
Single	14 (7.3)
<b>Occupation<sup>^</sup></b>	
Salaried worker	14 (7.3)
Domestic services/house wife	18 (9.4)
Manual worker/laborer	3 (1.6)
Agriculture & farmer	136 (70.8)
Small scale business	16 (8.3)
<b>Religion<sup>^</sup></b>	
Christian	181 (94.3)
Other	10 (5.7)

<sup>^</sup> Missing data: Marital status n=1, Occupation n=5 Religion n=1

The majority (33.3%) of participants were aged 26-30 years, with educational status of primary dropout (26.7%), and married (88%) (Table 1). The majority was working in agriculture or farming (70.8%), and with Christian affiliation (94.3%)

**Knowledge and practice on ENC; thermoregulation**

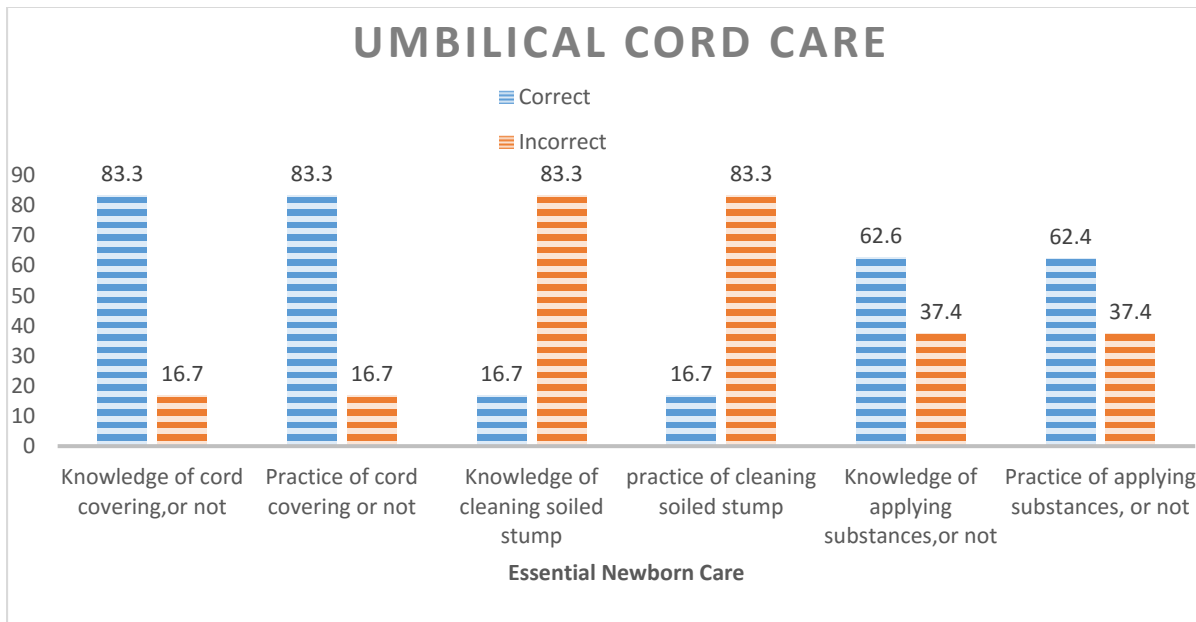


**Figure 1. Thermoregulation knowledge and practice**

The participants were asked to identify the first mode of thermoregulation after birth (Figure 1). The findings showed that the majority (74.5%) correctly identified skin-to-skin contact (SSC) to be the first mode of thermoregulation, whereas nearly a quarter (21.9%) did not practice this method. The majority (92.7%) correctly identified delaying the first bath

until after 24 hours, and most did delay the bath (83.9%). The majority (60.4%) knew to wrap the newborn in clothes; however, less than half (39.6%) did wrap the newborn in clothes. The majority (96.9%) failed to recognize that small birth weight (SBW) neonates have increased needs of thermal care than normal birth weight (NBW) newborns.

**Knowledge and practice on ENC: Umbilical Cord Care**

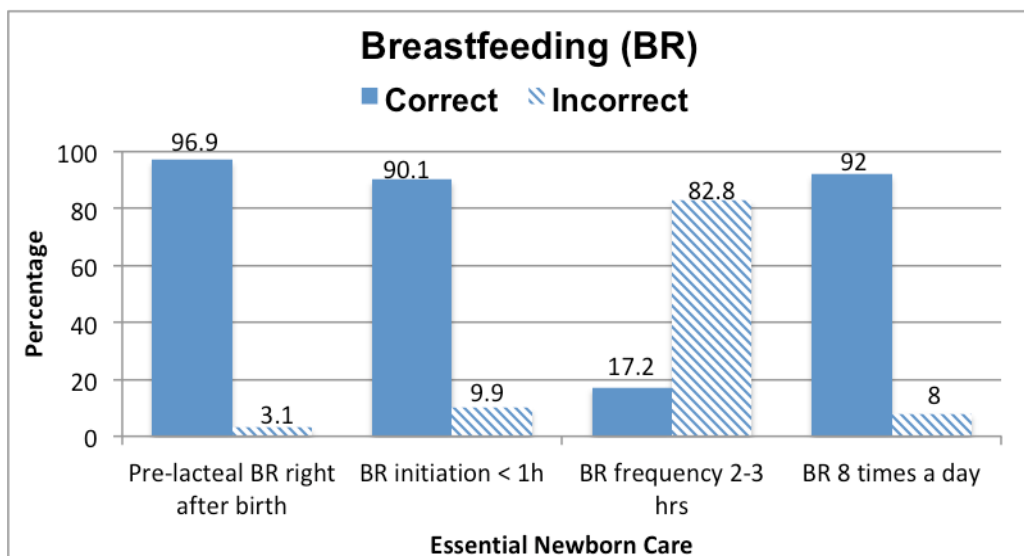


**Figure 2. Cord care knowledge and practice**

The participants were asked about their knowledge and practice of umbilical cord stump (Figure 2). The majority (83.3%) knew that a soiled cord stump with urine or stool should be cleaned and dried with a clean cloth instead of water and that over a third (37.4%) reported incorrectly applying substances to

the cord stump after cleaning and most mentioned lotion. Results indicated that the majority has the correct knowledge (83.3%) and practice (83.3) of not covering the umbilical cord. However, yet a few (16.7%) reported covering the cord stump.

**Knowledge and practice on ENC: Breast Feeding**



**Figure 3. Breastfeeding a combination of knowledge and practice**

Breastfeeding knowledge and practice by the participants was presented (Figure 3). Nearly all (96.9%) knew the value of colostrum to the newborn right after birth. The majority had breastfeeding knowledge and practice within

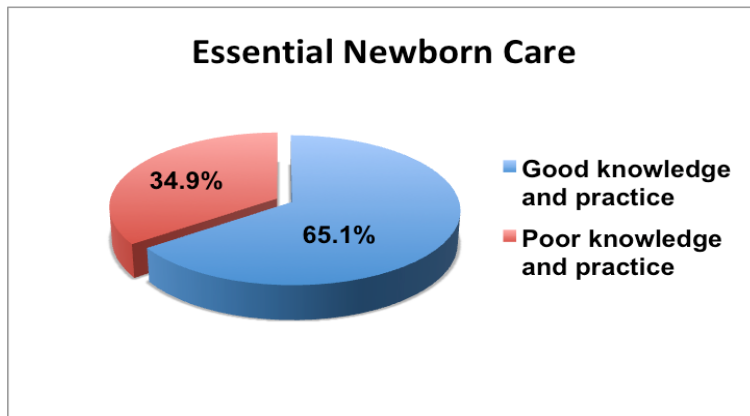
the first hour after birth (90.1%), and breastfeeding eight times a day (92%). However, a limited number (17.2%) reported the correct time for subsequent breast feeding of every 2-3 hours.

**Table 2. Participants' knowledge and experience of Danger Signs**

Danger Signs	Knowledge n (%)		Experienced n (%)	
	Good	Poor	Yes	No
Awareness	101 (52.6)	91 (47.4)	38 (20.0)	152 (80.0)
Convulsions or fits	180 (94.2)	11 (5.8)	3 (1.6)	186 (98.4)
Inability to suck	177 (92.7)	14 (7.3)	22 (11.6)	167(88.4)
Lethargy (very weak)	170 (88.5)	22 (11.5)	8 (4.2)	181 (95.8)
Redness of umbilicus	164 (85.9)	27 (14.1)	6 (3.2)	183 (96.8)
Persistent vomiting	181 (94.8)	10 (5.2)	9 (4.8)	180 (95.2)
Difficulty breathing	179 (93.2)	13 (6.8)	9 (4.8)	180 (95.2)
Abnormal body temperature	181 (94.8)	10 (5.2)	21 (11.1)	168 (88.9)
Cold body temperature	156 (81.7)	35 (18.3)	2 (1.1)	187 (98.9)
Infant yellow/jaundice	165 (86.4)	26 (13.6)	4 (2.1)	185 (97.9)
Red swollen eyes	170 (89.0)	21 (11.0)	22 (11.5)	170 (88.5)
Diarrhea	176 (92.1)	15 (7.9)	10 (5.2)	182 (94.8)

The participants' knowledge and experience of neonatal danger signs are presented in Table 2. Different proportions, as indicated, show how participants were able to recall danger signs after reading them on the list of the questionnaire. The top danger signs that were less identified by participants as neonatal danger signs were unusually cold body temperature (18.3%), too small birth weight (18.3%), and redness of umbilicus (14.1). In addition, however, over half (52.6%) were able to identify danger signs after mentioning them on the questionnaire; the three most commonly recognized danger signs were abnormal high body temperature (94.8%), persistent vomiting (94.8%), and convulsions (94.2%) respectively.

Furthermore, findings regarding experiences on danger signs, participants revealed that (80%) have not experienced danger signs with their neonates. Less than a quarter (20%) did mention they had observed some in their neonates. The top three observed by mothers during the postpartum period included the inability to suck (11.6%), swollen red eyes (11.5%), and abnormally high body temperature (11.1%). In addition, the top three danger signs that were less mentioned to have been experienced by mothers were unusually cold body temperature (1.1%), convulsions (1.6%), and yellow/jaundice (2.1%).

**Overall knowledge and practice of ENC****Figure 4. Overall knowledge and practice of ENC**

The overall knowledge and practice of ENC are presented in Figure 4. Of the 192 postnatal mothers, 65.1% had good knowledge and practice, while 34.9% had poor knowledge and practice towards essential newborn care.

**Table 3. Factors associated with knowledge and practice of ENC**

Variables	OR	95% CI	p-value
<b>Sociodemographics</b>			
Age	1.526	(-0.015-0.089)	0.003
Education	1.454	(-0.105-0.097)	0.137
Marital Status	0.932		0.767
Occupation	1.280		0.136
Religion	6.426		0.085
ANC Attendance	4.622	(0.451- 47.329)	0.197
<b>ENC education</b>			
During pregnancy	1.413	(0.707- 2.827)	0.328
After delivery	2.248	(1.137- 4.446)	0.020

ENC = Essential newborn care, OR = Odds Ratio, CI = Confidence Interval

^ Missing data: CI for Marital status; Occupation; Religion

Binary logistic regression was used to identify significant associations between two variables and is presented in Table 3. The findings show that the maternal age is statistically associated with mothers' knowledge and practices of ENC (OR=1.526, CI -0.015-0.089, p=0.003). Participants who received ENC education postpartum are over two times more likely to have good knowledge



and practices of ENC (OR=2.248, CI=1.137-4.446, p=0.020) than those who do not receive ENC education postpartum.

Other findings that were not statistically significant included marital status (p=0.767), an education level (p=0.137), maternal occupation (p=0.136), ANC attendance (p=0.197), and ENC education during pregnancy (p=0.328).

## DISCUSSION

Essential Newborn Care is a set of evidence-based guidelines established by the WHO to decrease newborn morbidity and mortality. Our study findings reveal that about two thirds (65.1%) of participants had 'good' knowledge and practice of ENC, and a third (34.9%) had 'poor' knowledge and practice on all four ENC components. A similar study conducted in Addis Ababa, Ethiopia. [5] found a notably higher average of 60.2% with poor ENC knowledge, and the difference could be related to the participants' sociodemographic variables. The demographics showed that the majority of participants aged 26-30 years (33.3%), and were primary dropout or had no formal education (38.2%). The majority was also married (88.0%), worked in agriculture or farming (70.8%), and had a Christian affiliation (94.3%). Maternal age and knowledge and practice of ENC may be viewed from different perspectives, as indicated by two studies conducted in sub-Saharan Africa.

In the Hoima District of Western Uganda.[14] adolescent mothers had suboptimal knowledge with some ENC components, and this was likely related to a premarital and unwanted delivery, lacking support and facing social stigma. In contrast, older mothers of advanced age may have unrealistic practices. In Ethiopia,[5] a study on intergenerational transmission of newborn care practices indicated that the majority of multiparty mothers and grandmothers had unrealistic newborn practices, such as covering the newborns and using substances on their skin. These variations suggest the need for consideration of age while disseminating ENC information.

Furthermore, in the context of sociodemographics, maternal educational level found to be a factor related to ENC knowledge and practice. The majority (26.7%) of participants were primary dropouts, and illiterate (11.5%). Similar data from the National Institute of Statistics and Research in Rwanda indicated that Kayonza District had 15.1% of mothers with no formal education.[2] A study in the Lawra District of Ghana, on the prevalence and determinants of ENC practices, revealed that mothers attained at least secondary school were 20.5 times more likely to provide optimal thermal care.[17] Also, in the Mandura District of Northwest

Ethiopia, the likelihood of good newborn care practices was more than two times higher among mothers who had attended high school and primary school.[18] The findings of our study could serve as a baseline to promote the knowledge and practice of ENC, especially among illiterate people or those with low educational achievement.

Findings from a study in Bangladesh and Ethiopia revealed that mothers knew thermoregulation measures, such as recognition of the first bath. [6,19] while a similar study in Ghana reported a gap in knowledge of thermal care 34.9%.[17] In Sri Lanka, they found that 69% of mothers were washing their baby's body without drying the wet head, which leads to hypothermia.[22] This finding is most comparable to the study in Gulomekada District of Eastern Tigray in Ethiopia where 45% of mothers were using poor thermal care practices.[23] In the present study, the thermoregulation measures were correctly practiced with their newborns and this may be due to the high number of deliveries (91.8%) in Rwandan health facilities, where skilled birth attendants promote SSC interventions and delay the first bath.

In addition, nearly a quarter (21.9%) of the mothers were not placing their neonates in SSC, and many (16.1%) also bathed their newborns before 24 hours after birth. Furthermore, very few (3.1%) participants recognized that small birth weight newborns need more thermal care than normal birth weight newborns. Being discharged home with a small birth weight newborn, or delivering in the community, possesses a higher risk of neonatal mortality as indicated in the study in Uganda.[21] The neonatal mortality in our country and worldwide is mostly associated with premature and small birth weight newborns as a result of disturbed optimal thermal-regulation. [20] Then, it is unfortunate that many mothers in the present study had poor knowledge of thermoregulation in small babies. These findings suggest further strategies to promote maternal knowledge in best care of this vulnerable population such as continuous SSC and kangaroo care.

There was a predominance in the correct practice of umbilical cord care in this study specifically for the practice (83.3%) of not covering the cord, and not applying a substance to the stump (62.6%). It is also

important to note in the present study that; very few applied clean water to a stump when it was soiled with urine or stool (16.7%) and the majority (83.3%) supports the idea of using a dry cloth to clean a soiled stump and apply lotion. Similar studies in Bangladesh and Ghana reported gaps in knowledge of cord care 36.8%.[6,17] Moreover, high proportions of poor knowledge and practice were reported in studies of Gulomekada District of Eastern Tigray in Ethiopia with 60% of mothers applied butter or oil to the cord stump after cleaning,[23] and a prospective study in North-Western Ethiopia where unclean cord care was high at 85.2%.[24] Special considerations are needed to bridge the gap in the prevention of neonatal infection, which is among the three leading causes of neonatal mortality. In addition, further studies are needed to link the poor practice of cord care with incidences of systemic sepsis and omphalitis in the neonatal period, which is mostly observed in our health facilities.

The results indicate that the majority practiced some ENC components of breastfeeding correctly. Specific interventions included pre-lacteal breastfeeding right after birth (96.9%), and breastfeeding initiation within the first hour (90.1%). The majority (92.0%) also knew to breastfeed eight times a day, yet only a few (17.2%) recognized the frequency of breast feeding to be every 2-3 hours, while the majority (82.8) indicated poor knowledge and practice of feedings every 2-3 hours. Conversely, most mentioned breastfeeding when their baby cries, or more often (undefined time). Similarly, in Bangladesh, a study revealed that mothers had correct knowledge on early initiation of breastfeeding and the importance of colostrum. [6] In the same vein a study in Ghana reported 73.7% of mothers provided adequate breastfeeding.[17] These encouraging findings could be attributed to the numerous interventions conducted in Rwanda for the promotion of breastfeeding to be soundly effective, more especially timely initiation as discussed in many studies and its implementation is seen to be improving, However, the gap observed in knowledge and practice for subsequent hours of feedings per day may be expected to be lack of similar packages or variation in delivery of ENC components among postnatal mothers.

There was good knowledge of the three most commonly recognized danger signs including abnormally high body temperature (94.8%), persistent vomiting (94.8%), and convulsions (94.2%). In contrast, the least recognized danger signs included, unusually cold body temperature (18.3%), small birth weight (18.3%), and redness of umbilicus (14.1%). A similar study of 414 mothers in Nakuru Central District of Kenya, reported that 84.5% identified the following neonatal danger

signs; hotness of newborn's body (fever) (74.9%), difficulty breathing (46.6%), poor sucking (40.1%), jaundice (35.3%), and lethargy or unconsciousness (5.8%).[25] Another study at Woldia General Hospital in Ethiopia reported that 88.3% of postnatal mothers identified less than six neonatal danger signs.[26] The hotness of the newborn's body was the most commonly recognized sign (53.8%), inability to breastfeed (34%), convulsions (30.5%), lethargy (28.4%), and difficulty breathing (22.3%) were recognized as newborn danger signs.

The neonatal danger signs experienced in the present study are similar to other studies mentioned above. The most common neonatal danger signs experienced in the study included the inability to suck (11.6%), swollen red eyes (11.5%), and abnormally high body temperature (11.1%). The three less common neonatal danger signs experienced in the study included unusual cold body temperature (1.1%), convulsions (1.6%), and jaundice (2.1%). Similarly, the Kenya study highlighted hypothermia (9.7%) and convulsions (11.1%) as their newborn's experienced danger signs.[25] The fact that there is a gap existing in recognition of some danger signs such as hypothermia, may hinder recognition or observation during the crucial neonatal period. Therefore, emphasis is needed to promote mothers' knowledge, especially on less recognized danger signs such as hypothermia.

The findings finally suggest that ENC education after birth is an important covariate with knowledge and practice. In an Ethiopia study,[5] ENC education was more effective after birth than during whereas, a study a study conducted in the UK by Pillay stated that various teaching approaches, such as on-site teaching sessions on newborn care organized support groups, and community-based newborn care packages targeting parental roles, help prevent neonatal mortality.[15] Moreover, the recent study in Rwanda by Mukarubayiza and Gowan,[16] on parental roles after birth in the Neonatal Intensive Care Unit, indicated that, there are no formal groups specific for teaching and orienting parents how to care for their neonates after birth. Therefore, strategies to improve education on essential newborn care after birth, are highly needed, especially in low socio-economic settings, where the majority of people have a lower educational background.

### Limitations

The study's findings could not be considered to represent the whole population of the district. Some data were missing due to the rural data collectors. Due to the retrospective nature of the study, some bias may have been introduced by mothers recalling

what happened within the hours and days following birth. The questionnaire assessed the practice of participants based on their self-report, yet there were no means of proving their reality.

### Recommendations

The ENC implementers are mainly mothers and HCP; therefore, more research is needed to indicate the magnitude and status of ENC knowledge and practice at the national level and link it to the neonatal complications during the postnatal period. It is also recommended that the UR School of Nursing master's program, in collaboration with the Ministry of Health and Education, organize educational programs to increase the awareness of the ENC components, especially for delivered mothers.

### CONCLUSION

The study findings show that over a third of participants had poor knowledge and practice, which is inconsistent with WHO ENC guidelines. Significant gaps were found in cord care, thermoregulation of small birth weight newborns, and timing of breastfeeding; therefore, an emphasis should be made on these components. Whereas, factors strongly associated with ENC knowledge and practice included education of ENC post-delivery and maternal age. A further study is needed to find the relationship between poor knowledge and practice related to neonatal complications.

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### Authors' contribution

MB as the main author led all aspects of the study, from literature search, designing its methods, collecting data, data entry, data interpretation, part of data analysis, and writing the manuscript, EU supported in data collection and provided regular constructive ideas, AO was the overall supervisor, critically reviewed and analyze each and every step of the study.

### Conflict of Interest declaration

The authors declare that they have no competing interests.

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