

Umbilical Cord Care Among Postnatal Mothers in Kibungo Hospital Catchment Area, Rwanda

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ABSTRACT

Background

Infections contribute to 30% of the 2.5 million neonatal deaths that occur globally every year. A newly cut umbilical cord can be a pathway for bacteria to enter the vulnerable neonate and cause neonatal sepsis. Most infections are preventable with evidenced-based cord care.

Objective

To assess postnatal mothers' knowledge and practice of umbilical cord care in the Kibungo Hospital catchment area in Rwanda.

Methodology

A descriptive cross-sectional study design and purposive sampling strategy was used to recruit 224 postnatal mothers. Data were collected using a structured questionnaire. Descriptive and inferential statistics were used to analyze data.

Results

A third of mothers (33%) had adequate knowledge, and a half (54%) had good umbilical cord care practice. The majority (70%) reported dry cord care practice, though many applied substances including Vaseline (23%) and Movit ointment (15%). There was a negative correlation between knowledge of cord care and substance applied to cord ($R^2=0.224$, $p=0.001$), and days applied ($R^2=0.167$, $p=0.012$).

Conclusion

The study population had low cord care knowledge. Health care providers need to educate mothers on the practice of allowing the cord to dry naturally, and discourage the use of harmful substances that delay cord separation and increase risk of sepsis and subsequent neonatal mortality.

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BACKGROUND

Every year 2.5 million neonatal deaths occur globally in the first month after birth, and infections cause 30%. [1] A common portal of entry for bacteria colonization is a newly cut umbilical cord that provides direct access to the neonatal bloodstream. [2] Neonatal mortality has not decreased globally as much as other under-five child deaths, and sub-Saharan Africa (SSA) continues to have the highest (36%) under-five mortality rates of any region. [3] Evidenced-based umbilical cord care practice has significant potential to reduce neonatal death related to bacterial

contamination, and therefore “ranks among the greatest public health opportunities of the 21st century”. [2]

During pregnancy, the umbilical cord serves as a lifeline between the mother and the fetus; however, at birth, the cord is cut, and the remaining umbilical stump can act as a conduit potentially leading to a systemic infection, known as neonatal sepsis. [4] A systematic review by Coffey et al. [5] of 15 low-to-middle-income countries (LMIC), including eight countries in SSA, revealed streptococcus, Escherichia coli, and Listeria monocytogenes are the most common intracellular

pathogens causing newborn sepsis. Also, *Clostridium tetani* is another deadly bacteria that can enter the neonate's system via the cord stump.[6] These infections are rarely seen in industrialized countries and more commonly seen in developing countries.[4]

Risk factors associated with omphalitis (cord infection), neonatal tetanus and sepsis include maternal infection, premature rupture of membranes, prolonged rupture of membranes, non-hygienic birthing environment, low birth weight (< 2500 g), and prior umbilical catheterization.[7] The World Health Organization (WHO) recommends dry cord care (dry naturally) for neonates born in healthcare facilities, or at home in low neonatal mortality settings, and a daily application of chlorhexidine (7.1%) should be used where infection rates are high, and the neonatal mortality rate is $\geq 30/1000$. [3] Chlorhexidine is an antiseptic solution that should be used when hygienic conditions are poor, instead of harmful traditional substances, such as cow dung,[5] or others that extend the cord separation time and increase the likelihood of infection such as neonatal sepsis.[5]

A systematic review [5] described the traditional cord-care practices and how they vary depending on cultural group and range of substances. Results revealed the following product categories: bodily fluids, food, herbs/ plants/spices, minerals/powder, oils, personal care, and medical products, and water that are applied to the cord to promote healing and speed-up cord separation.[5]

Recent strategies that Rwanda has employed to reduce maternal and neonatal mortality include education on emergency obstetric and neonatal care and immediate postnatal care.[8] and facility-based births over homebirths.[9] An understanding of traditional cord care practices in LMIC can help promote interventions that reduce neonatal sepsis. What postnatal mothers know about cord-care and what substances they apply to the cord has not been evaluated in detail in Rwanda. This information may help HCPs deliver the best practice interventions on time that have been proven effective in reducing the neonatal mortality rate. This study aims to assess postnatal mothers' knowledge and practice of umbilical cord care in the Kibungo Hospital catchment area.

METHODS

Design

A descriptive cross-sectional study design was used to assess the knowledge and practice of umbilical cord care among postnatal mothers living in the

Kibungo District. Data collection occurred from March 11 to April 12, 2019.

Participants' recruitment

The target population was estimated to be 519 postpartum mothers living in Ngoma District that were giving birth the last three months prior to data collection, and brought their newborns to the vaccination clinic. The newborns were from one day to six weeks of age. Mothers with newborns older than six weeks and attending other health centers were not included. A purposive sampling strategy was used to select mothers fulfilling the inclusion criteria from the five selected health centers from among the 15 health centers in the district. A sample of 224 of mothers was obtained using Taro Yamane formula, with a confidence interval of 95% and a margin error of 5%.

Measures

The instrument used was from a study conducted in Western Uganda on newborn care practices among 410 adolescent mothers in Hoima District, Western Uganda in 2016.[10] Permission to use the instrument and related documents was given by Lydia Kabwijamu on May 2, 2018 via email. The instrument was a self-administered questionnaire and comprised four sections:

Section 1: Sociodemographic data characteristics consisted of 10 variables: maternal age, education, marital status, occupation, religion, husband's education, place of birth, and newborn's gender (Table 1). Newborn's age was measured in days since birth and presented in frequencies (Figure 1).

Section 2: Knowledge assessment consisted of four variables; health care provider (HCP) examines baby's cord during hospitalization; HCP gave mother information about cord care (from birth to time it fell off); other sources of information of cord care; bath in first week; and hand washing before cord care. Variables were measured as Yes (1 point) or No (0 points) and presented as frequencies (Figure 2).

Overall adequacy of knowledge score (1 item) was categorized as adequate knowledge or inadequate knowledge. Knowledge score was calculated to give the cut off point for knowledge levels with a mean score of 9. A mean score of 6-9 indicated there was not adequate knowledge, and a mean score of 10-12 indicated there was adequate knowledge. Scores were presented as frequencies (Figure 3).

Mothers' basic pre-requisite knowledge of cord care included four variables; cord hygiene (3 items); newborn bathing (5 items), substances added in bath water (4 items), and maternal handwashing (3 items). Variables were measured as Yes (1 point) or No (0 points) and presented as frequencies (Table 2).

Section 3: Cord care practices included six variables; material used to cut the umbilical cord (3 items), material to tie the umbilical cord (5 items), substances applied after delivery (8 items), other substances put on umbilicus (12 items), and beliefs about substances used (5 items). Variables were measured as Yes (1 point) or No (0 points) and presented as frequencies (Table 3). In addition, another variable addressed the number of days the substance was applied to the cord (5 items) (Figure 4).

Section 4: Associations were measured using bivariate analysis between the mothers' knowledge levels and health centers where the mothers gave birth (Table 4); and between overall knowledge and practice (Table 5).

The modified questionnaire was adapted to postpartum mothers in the local context and translated to Kinyarwanda. A Cronbach's alpha for internal coefficient was calculated, and 0.70 was obtained, which is within the normal range.

Data collection

After obtaining permission to conduct the study at the health centers, nurses assisted the investigator and research assistants (RAs) to identify postnatal mothers with newborns aged one day to six weeks at the vaccination clinics on a daily basis. The RAs had received prior training about the study from the investigator the week before data collection began.

Mothers were approached on an individual basis while waiting to have the newborn vaccinated. The purpose of the study was explained, and mothers were assured that their responses would be kept confidential, anonymous, and they could withdraw from the study at any time. Mothers also had the chance to ask questions and receive answers, and then signed the written consent form. Mothers completed the self-administered questionnaire in about 50 minutes. The completed questionnaires were collected on the same day, and only the investigator had access to the data.

Data analysis

Data were entered and coded into the computer using SPSS version 21.0. Descriptive statistics of frequencies and percentages were used to present data in the tables and figures. Inferential statistics were used to analyze the relationship between the level of knowledge and practice variables. Results with a p -value < 0.05 were considered as statistically significant.

Ethical consideration

Permission was obtained from the University of Rwanda Institutional Review Board in the College of Medicine and Health Sciences, the Ethics Committee at Kibungo Hospital, and managers of the selected health centers. Also, all participants signed a consent form.

RESULTS

The response rate in the study was high (99.5%), with 224 out of the 226 postnatal mothers approached, participated in the study. The participants' sociodemographic characteristics are presented in Table 1.

Table 1. Sociodemographic characteristics (n=224)

Variables	n (%)
Maternal age (years)	
15-20	14 (6.3)
21-35	177 (79.0)
36-50	33 (14.7)
Education	
Primary	156 (69.6)
Secondary	38 (17.0)
University	4 (1.8)
Certificate/TVET	2 (0.9)
No formal education	24 (10.7)
Marital status	
Married	181 (80.8)
Single	38 (17.0)
Separated	5 (2.2)
Occupation	
Farming	191 (85.3)
Civil service	2 (0.9)
Trading	13 (5.8)
Craftwork	3 (1.3)
Unemployed	15 (6.7)
Religion	
Christian-Protestant	99 (44.2)
Christian-Catholic	83 (37.0)
Muslim	8 (3.6)
Adventist	11 (4.9)
Others beliefs	23 (10.3)
Husband's education	
Primary	128 (57.1)
Secondary	40 (17.9)
University	6 (2.7)
None	17 (7.6)
Other	7 (3.1)
Do not know	26 (11.6)
Place of birth	
Health Center	208 (92.8)
Home	10 (4.5)
On way to health facility	6 (2.7)
Gender	
Female	136 (60.7)
Male	88 (39.3)

Results of the sociodemographic characteristics indicated the majority of mothers (79.0%) were 21-35 years old, attained primary education (69.6%), worked as farmers (85.3%) and of Christian-Protestant affiliation (44.2%) (Table 1). The majority (80.8%) were married, and similarly the husband attained primary education (57.1%). Most mothers gave birth at the health centre (92.8%), to a female (60.7%) newborn.

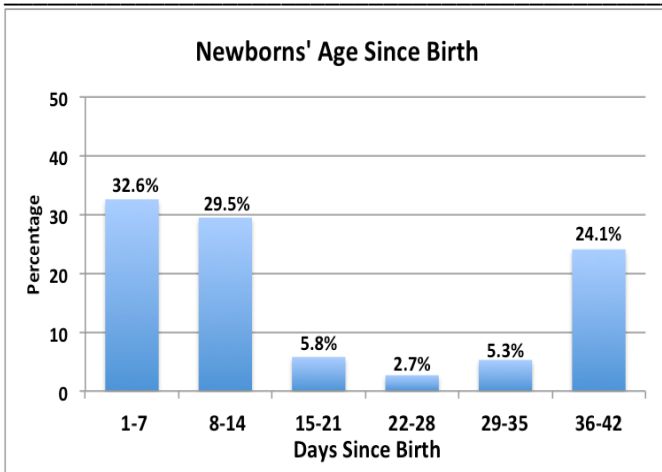


Figure 1. Newborns' age in days since birth

Results of the newborns' age involved in the study were presented in Figure 1. The majority of newborns were aged between 1-7 days since their birth.

Mother's knowledge related to cord care

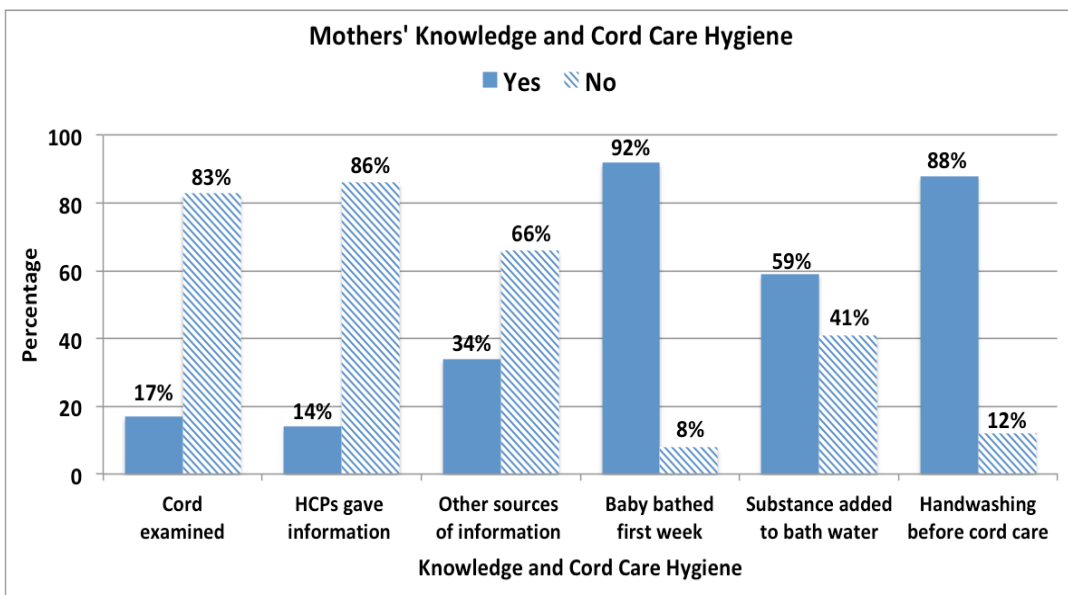


Figure 2. Mothers' knowledge and cord care hygiene (n=224)

Results of the mothers' knowledge related to the cord and cord care provided during the first week (Figure 2). The majority (83%) did not know if the HCPs had examined the cord, and most mothers did not receive information on cord care from HCPs (86%), or other sources (66%). The majority of mothers (92%) bathed their newborn in the first week, added a substance to the bath water (59%), and washed their hands prior to performing cord care (88%).

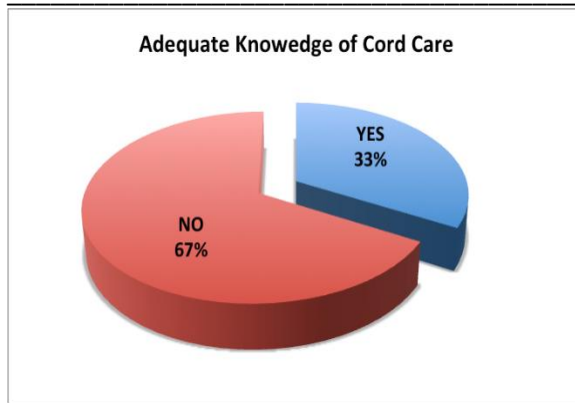


Figure 3. Adequacy of mother's knowledge of cord care (n=224)

Results of the adequacy of the mother's knowledge of cord care are presented in Figure 3. A mean score of 6-9 indicated there was not adequate knowledge, and a mean score of 10-12 indicated there was adequate knowledge. Only one third (33%) had adequate knowledge, and two thirds (67%) had below the average score, indicating they did not have adequate knowledge.

Knowledge of cord hygiene

Table 2. Knowledge of cord hygiene (n=224)

Knowledge	n (%)
Time of bathing	
≤ 24 hours of birth	26 (11.6)
1 day after birth	96 (42.8)
2 days	43 (19.2)
≥ 3 days	36 (16.1)
No response	23 (10.3)
Substances added to water	
Hand or body solid soap	110 (49.1)
Dettol soap	22 (9.8)
Other substance	2 (0.9)
None	90 (40.2)
Hand washing	
Water in basin	127 (56.7)
Running water using soap	72 (32.2)
Did not wash hands	25 (11.1)

Results of the mothers' knowledge of cord hygiene are presented in Table 2. The majority (78.1%) knew not to bath the baby within the first 24 hours after birth, though that included quite a high proportion (10.3%) that did not respond to the question. The majority (49.1%) added hand or body solid soap to the bath water. More than a half (57%) of mothers had the wrong information about hand washing, by not knowing to use running water and soap.

Table 3. Umbilical cord practice (n=224)

Variables	n (%)
Instrument used to cut cord	
Scissors at health center	214 (95.5)
Razor blade	6 (2.7)
Other tools at home	4 (1.8)
Material used to tie cord	
Plastic material from health center	204 (91.1)
Tie from health center	10 (4.5)
Banana fiber	1 (0.4)
Piece of clothes	5 (2.2)
Other material	4 (1.8)
Substances applied to cord*	
Air dry	157 (70.0)
Breast milk	4 (1.8)
Chlorhexidine	6 (2.6)
Cow ointment	4 (1.8)
Onion	1 (0.4)
Saliva	2 (0.9)
Vaseline ointment	51 (22.7)
Nonresponse	2 (0.9)
Other substances applied to cord	
None	170 (75.9)
Ashes	1 (0.4)
Bread	2 (0.9)
Excretory wastes from rat	2 (0.9)
Family jelly	1 (0.4)
Movit ointment	34 (15.2)
Oil	5 (2.2)
Pumpkin's flowers	1 (0.4)
Sante soap	1 (0.4)
Tree wax	2 (0.9)
Other	4 (2.4)
Belief about substance on cord	
Cord will dry quickly	121 (54.0)
Cord will fall off quickly	87 (38.8)
Baby will not have an infection	2 (0.9)
Cord will heal quickly	10 (4.5)
Cord will dry and fall off quickly	4 (1.8)

* Total > 100% due to more than one substance applied

Results of the instrument used to cut the cord, tie the cord, and other cord care is presented in Table 3. Most newborns were born at the health facility and therefore scissors were used to cut the cord (95.5%), and a plastic material was used to tie the cord (91.0%). The majority (70.0%) of mothers allowed the cord to air dry naturally, and did not apply any substance (75.9%). However, various other substances were used, including Vaseline ointment (23.0%), and Movit ointment (15.2%). The majority of mothers' belief about cord care was that it would dry quickly (54.0%), and the cord would fall off quickly (38.8%).

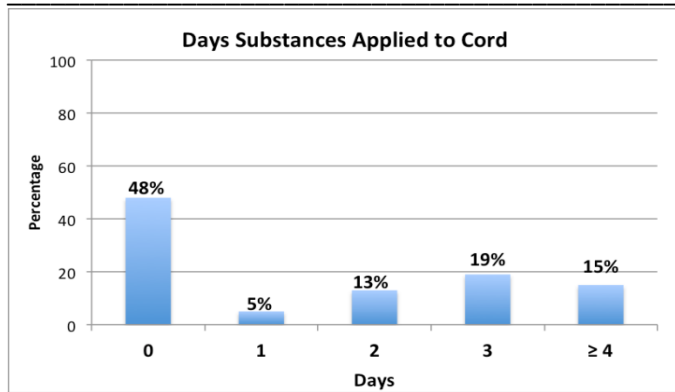


Figure 4. Number of days substances applied to cord

About a quarter (24.1%) of mothers did apply a substance to the cord, and the number of days the substance was applied is presented in Figure 4. The majority (19%) applied a substance for three days.

Association between knowledge and health centers

Results of the bivariate analysis between the mothers' knowledge and related health centers are presented in Table 4.

Table 4. Relationship between knowledge and health centers (n=22)

Health Center	Knowledge Per Health Center n (%)			
	Total	Adequate	Inadequate	p-value
Kibungo	71 (31.5)	34 (47.9)	37 (52.1)	
Mutendeli	47 (21.0)	7 (14.9)	40 (85.1)	
Nyarugenge	46 (20.5)	19 (41.3)	27 (58.7)	0.000
Remera	23 (10.3)	11 (47.8)	12 (52.2)	
Rukira	37 (16.5)	4 (10.8)	33 (89.2)	

The results indicated that there is a statistical association between knowledge and the health center where the mother delivered ($p=0.000$) (Table 4). The knowledge level at all health centers was low, as was reported in overall knowledge scores. It was further reported that higher levels of knowledge are relatively low in all health centers.

Association between level of knowledge and cord care practice (n=224)

A bivariate analysis was measured by calculating the correlation coefficient between the mothers' overall knowledge and practice of cord care (Table 5).

Table 5. Bivariate analysis of association between overall knowledge and practice (n=224)

Variables	Knowledge Level	
	R ²	p
Gave birth at home	0.013	0.845
If Yes, what instrument used to cut cord	0.058	0.390
What material was used to tie cord?	0.016	0.812
Was substance applied to cord at any point from time it was cut and tied until it fell off?	0.105	0.119
Substance applied to cord	0.224**	0.001
Number of days substance applied to cord	0.167*	0.012

R² Pearson's correlation. * Correlation significant at 0.05 level (2-tailed)

The results of the bivariate analysis indicated that women who delivered at the health center were more likely to have improved knowledge of cord care compared to those who delivered at home. The results indicate that two variables have statistical association with overall knowledge. Both the substance applied to the cord after delivery (R² =0.224, p=0.001), and the number of days the substance was applied to the cord (R² =0.167, p=0.012) were negatively associated with knowledge of cord care. The other three variables did not indicate statistical significance (p > 0.05).

DISCUSSION

The purpose of the study was to assess the knowledge and practice of umbilical cord care among postnatal mothers that recently gave birth in the Kibungo Hospital catchment area in the Ngoma District in the Eastern Province of Rwanda.

Sociodemographic characteristics

The majority (79.0%) of postnatal mothers were aged 21-35 years, had attained primary education (70%), married (80.8%), and Christian affiliation (81.2%) (Table 1). The primary source of income is farming (85.3%), which is near the national average for Rwandans. Most births occurred in a health facility (92.8%), a high percentage related to the national strategy to have the majority of births in healthcare facilities, as opposed to homebirths. The majority (57.1%) of fathers had the same primary educational attainment as the mothers.

A cross-sectional study of mothers (n=324) in Nigeria reported a similar sample population with 75.5% less than 30 years of age, 89.5% married, and 63.4% had no formal education or primary education.[11] Also, 71% gave birth in a health facility, which in this Nigerian study was a predictor of good cord care practices (AOR=7.0; 95% CI 4.78–9.39).[11]

The age of the newborns during the time of data collection showed that a third (32.6%) was aged between 1-7 days, and nearly another third (29.5%) at 8-14 days (Figure 1). The former age group of newborns likely had the umbilical cord attached, and the second age group likely had the cord separated. A cord that is allowed to dry naturally falls off in about six days, whereas substances applied to the cord typically prolong separation time, to eight or more days.[12]

Our study included mothers with newborns, though in other studies inclusion criteria had much older children. Authors Misgna et al. [13] in Eastern Tigray, Ethiopia included mothers with infants up to six months of age, Chickiabellu et al. [14] in Southern Ethiopia included mothers who gave birth within one year, and Afolaranmi et al. [11] in North Central Nigeria included children up to 59 months. Therefore, mothers of older children may have recalled cord care information differently.

Postnatal mothers knowledge of cord care

Overall, only a third (33%) of mothers had adequate knowledge of cord care (Figure 2). In contrast, other studies indicated that 73.8% of mothers had good knowledge of cord care in Nigeria[11] and Dhaka Shishu Hospital in Bangladesh.[15] Knowledge of

cord care provided during the first week shows that the majority (83%) of participants did not know if the HCP had examined the cord at birth (Figure 3). The majority (86%) also did not receive information from HCPs on cord care. In contrast, a cross-sectional study in Tigray, Ethiopia, reported that 85.5% of mothers obtained health information from HCPs.[13] These differences in cord care knowledge could be related to the maternal age and parity, educational levels of parents, and access to resources, including health information, birth site, and cultural groups.

Cord care hygiene

Results of knowledge and cord care hygiene included timing of the first bath, substances added to the bathwater, and maternal handwashing (Table 2). The majority (78.1%) of participants delayed the first bath for at least 24 hours after birth. Similarly, 65% of mothers bathed their newborns after 24 hours in a study in Pakistan.[16] as did 65.3% of mothers who had a home birth in Southern Ethiopia .[14] Whereas a systematic review.[16] of 42 older studies (2000-2014) in SSA countries found that 50% of newborns were bathed within six hours of birth, though early bathing was less frequent in facilities that lacked water.[16] Perhaps there has been a change over time with access to evidenced-based practice recommended by WHO. Hence, newborns have less chance of hypothermia, and the attendant sequelae to hypoglycemia and death, and vital need to allow the vernix to absorb in the newborn's skin as added protection.

The WHO,[3] recommends that in order to maintain thermal regulation, bathing the newborn should be delayed the first 24 hours after birth. If cultural reasons prevail, bathing should be delayed until the newborn is at least six hours of age. [3] The main reason to delay the bath beyond 24 hours is to preserve thermoregulation because if the newborn's temperature decreases, the risk of hypoglycemia increases, leading to death.[3] Furthermore, vernix, the greasy white substance on the newborn's skin (particularly pre-term newborn), is protective and should be absorbed naturally.[3]

Knowledge of best practice in handwashing was low, with about half (56.7%) of mothers preferring to use water in a basin, instead of running water and soap. This situation is easy to explain, as most mothers in rural settings have to fetch water from a communal site and then at home rely on water in a basin. Mothers in a Nigerian study indicated that 47.3% used soap and water to wash their hands, but did not specify whether they used running water from the tap or in a basin.[11]

Practice of umbilical cord care

Our results showed that nearly all (95.5%) of umbilical cords were cut with scissors in the health centers, where most of the deliveries took place (Table 3). Similarly, a study in Dhaka Shishu Hospital in Bangladesh reported that 64.2% of participants said a sterile blade must be used to cut the cord.[15] Authors of a cross-sectional study of mothers (n=450) who gave birth at home in Damot Pulasa District, Southern Ethiopia.[14] reported that 96.4% used a boiled new razor blade to cut the cord and 64% then applied butter on the cord. The authors noted 79.1% decided to deliver at home themselves, despite having a health post nearby.[14]

Since most births were conducted in a health facility, the majority (91.1%) of cords were tied with a plastic material specially used for tying umbilical cords. Generally, the mothers reported good practice by using the health facility-based material to cut and tie the cord within the WHO recommended practice.[3] A study in Ethiopia, (n=296) indicated that 95.6% of participants stated that a new tie should be used for cord binding.[13] A study in Nigeria,.[11] where most births were conducted in health facilities, showed that 73.1% used a cord clamp.

A few (4.5%) mothers in our study who had a home birth managed to obtain a "tie" to secure the cord from the health center. A community-based cross-sectional study on home births in Damot pulasa Woreda, Southern Ethiopia, showed that 98.2% of cords were tied with thread (98.2%).[14]

In our study, the majority (70%) did not apply any substance to the umbilical cord, as recommended by the WHO.[3] Similarly, a study conducted in Gulomekada District, Eastern Tigray, Ethiopia, indicated that 66.6% of participants thought nothing should be applied to the cord stump.[13] Other studies in SSA were in contrast to our findings. Only 31% of adolescent mothers practiced dry cord care in Hoima District, Western Uganda,[10] and instead used "potentially hazardous substances" to the cord, including 51% had applied salty water, 20.1% local herbs, and 11.7% talcum powder. Also, a study conducted in Nigeria showed that only 13.6% of participants used dry cord care, as they used Methylated spirits to clean the cord first.[11] Although the Nigerian study was conducted recently (2017), the study sample included mothers with children less than 59 months, possibly when dry cord care was not recommended in LMIC.[11]

Interestingly, though only a third (33%) in our study had adequate knowledge of cord care (Figure 2), and the majority (86%) had not received information from HCPs, or others (68%) (Figure 3), 70% reported the WHO recommendation of dry cord care.[3] It would be good to know where these mothers obtained their information.

The substance applied to the cord may depend on the perception of the cord's condition and the need to intervene. For example, petroleum jelly may be applied if the cord is cracking and bleeding, and a drying substance may be applied if the cord is taking an extended time to separate.[5] However, applying harmful substances on the cord exposes newborns to infections, one of the leading causes of neonatal mortality in SSA. Proper care of the cord using evidenced-based practice is essential for the survival of the newborn in SSA.

Belief about substance on cord

Our results show that nearly three quarters (71%) of participants allowed the cord to dry naturally, which is the WHO recommendation.[3] The results are in line with a study in Nepal that reported air drying is a safe method to reduce the risk of infection.[17] A Nigerian study,[11] where most mothers delivered in a health facility, 73.2% reported using Methylated spirits for cord cleaning to prevent infection, followed by dry cord care. The authors noted that Methylated spirits were not used in other studies.[11] The systematic review by Bee et al. [16] of 42 older studies (2000-2014) in SSA countries found the application of a substance to the cord was commonly done to prevent infections or increase wound healing.

Beliefs about applications to the cord differ based on the region, country, or cultural group.[5,16] There are numerous reasons for applying the substance to the cord and include the promotion of healing, speeding-up separation, maintaining a dry or moist stump, preventing pain or bleeding or infection, and “keeping the wind (evil spirits) or cold/air” out of the newborn. Some substances are applied to the cord for medicinal purposes if the cord is erythematous or has pus and include breast milk, banana, cow dung, tree bark, python oil, alcohol, traditional herbs, or dirt from a pounding stick .[5]

Days substance applied to cord

Of the mothers that applied a substance to the cord (24.1%), the majority (19%) applied the substance for three days (Figure 4). Coffey's review,[5] conducted in LMIC reported that only a few studies

mentioned the frequency of substances applied to the cord. In SSA, the range varied from a daily application to every 30 minutes; and from the day of birth to cord separation. Also, a few studies in Coffey's review identified who applied the substance. It was typically the newborns' mother, grandmother, or senior woman in the household, and rarely was it an HCP.[5] However, cord separation has great significance as it marked the end of the postpartum seclusion, in which mothers now had the freedom to move outside their homes, according to seven studies in Bee's review.[16]

The recommended cord care practice is to keep the cord dry and exposed to the air. Before touching the cord area, wash hands, and fold the diaper below the umbilicus stump to allow the air to dry. Clean with water if the cord or surrounding area is soiled with urine or stool. Avoid any substances on the cord, such as isopropyl alcohol, as it delays cord separation.[18]

Relationship between knowledge and health center

The results indicated that the health center where the participants delivered positively influenced the level of knowledge ($p=0.000$) (Table 4). An adequate knowledge level was higher among participants who gave birth at Kibungo (47.9%), Remera (47.8%), and Nyange (41.3%), and lower at Mutendeli (14.9%) and Rukira (10.8%). Kibungo and Remera health centers are mostly urban, whereas the other three are rural. Similarly, a community-based cross-sectional study in Mandura District, Northwest Ethiopia [19] reported that women in urban areas were three times (AOR=3.26, 95% CI: 1.90-5.57) more likely to have good newborn care practices as opposed to rural residents. Whereas in Nigeria, women in a rural area showed a negative association (AOR=0.26; 95% CI=0.091–0.723).[11]

Other factors than geographical location may influence cord care knowledge, such as better access to health services and higher educational status than others in rural areas. A study in Nigeria found that a health facility delivery was a predictor of good cord care practices (AOR=7.0; 95% CI=4.787–9.394), as opposed to non-health facilities such as the home, prayer houses, and traditional birth homes.[11] The place of delivery was also reported to be positively associated with knowledge of cord care in Nepal.[17] In addition to increased knowledge obtained at a health center, a study in Ruhango District, Rwanda, showed that the health center is a safer place for the neonate to deliver (AOR=8.24) than a non-health facility. [20]

Whereas women who had a home birth (n=450) in Southern Ethiopia showed a variation in practice levels though overall 24% knew essential newborn care practice.[14] with 96.4% safe cord-cutting using a boiled new razor blade, but 64% then applied butter to the cord. The town where the study was conducted in 2016 had five governmental health centers and eight private clinics. However, the women choose to give birth at home for the following reasons: 62.9% were not seriously ill, 54.9% had traditional birth attendants, 28% had experienced unwelcoming health workers approach, and 27.3% had previously experienced a safe homebirth. [14]

Significant associations between knowledge and practice of cord care

Our results indicate that the statistical significance of overall knowledge of cord care is negatively associated with the use of a substance on the cord ($R^2=0.224$, $p=0.001$), as well as the number of days the substance was applied ($R^2=0.167$, $p=0.012$) (Table 5). Therefore, lower knowledge level was associated with substances application and longer duration of use on the cord. Similarly, a study in Western Uganda.[10] showed that on bivariate analysis, adolescent mothers with knowledge of dry cord care were four times more likely (OR=4.39), and two times more likely with a male companion in the postnatal period (OR=2.09) to practice dry cord care.

Other findings in our study did not have statistical significance. There was no statistical association between the level of knowledge, hygiene, and socio-demographic variables, and this could be explained by the fact that our study sample was small, and groups were too small to allow correlational analyses. Other variables, such as birth at home, instrument to cut the cord, material used to tie cord, and substance applied to the cord at any point, had no significant association with knowledge of cord care. Mothers are highly influential in the care of neonates. Knowledge of mothers on neonatal care and proper practices of that knowledge could help to avoid unexpected circumstances such as the early signs of neonatal infection and, consequently, neonatal mortality. Umbilical cord infection is preventable through affordable and straightforward strategies, including evidenced-based cord care and avoiding unnecessary applications. There is a need to improve and implement targeted programs to increase awareness of cord care. A future study may involve a pre-test, post-test, and intervention with HCPs and larger sample size.

Limitations

This study was conducted in five health centers in the Ngoma District of Eastern Province in Rwanda; therefore, the findings could not be generalized in other health centers. Even though most mothers delivered at the health centers, it was a challenge to assess their knowledge of practices done by the HCP and practice they did at home. The vaccination clinics were open on the same days at some health centers and therefore did not permit the investigator to monitor the RAs data collection at all times.

CONCLUSION

This cross-sectional study on umbilical cord care at five health centers in Rwanda revealed that the mothers had a low level of knowledge and practice. Our results showed two significant associations, one between the mothers' knowledge and the substance applied to the cord, and the number of application days. Substances were applied to the cord, which is not WHO recommendations, and therefore, likely increases the duration the cord remains intact, and more importantly, the increased risk of cord infection due to the type of substance applied. Health education on essential newborn care practices should be integrated at the community level, beginning with ANC care to all mothers, whether they intend to give birth at the health facility or their home. Re-emphasizing essential newborn care knowledge and practice during postnatal care will further discourage harmful practices to prevent newborn infections and reduce neonatal morbidity and mortality.

Conflict of interest

No conflict of interest

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