



Original Article

## Enablers and Barriers to Chlorhexidine Use in Umbilical Cord Care: Voices of Care Givers and Healthcare Providers in Selected Counties in Kenya

Yvonne Opanga<sup>1\*</sup>, Sarah Karanja<sup>2</sup>, Zena Abdullahi<sup>1</sup>, Richard Gichuki<sup>1</sup>, Aneesa Ahmed<sup>1</sup>, Viola Tupeiya<sup>1</sup>, Daniel Omolo<sup>1</sup>, Happiness Oruko<sup>1</sup>, Mercy Mutua<sup>3</sup>, Samuel Muhula<sup>1</sup>, Elizabeth Wala<sup>4</sup> & Dorcas Indalo<sup>1</sup>

<sup>1</sup> Amref Health Africa in Kenya, P. O. Box 27691-0056, Nairobi, Kenya.

<sup>2</sup> WelTel International mHealth Society, P. O. Box 50197 00100, Nairobi, Kenya

<sup>3</sup> PHASTAR, Nairobi, Kenya.

<sup>4</sup> Options Consultancy Services, P. O. Box 44204 – 00100, Nairobi, Kenya.

\*Author for correspondence ORCID ID: <https://orcid.org/0000-0002-3163-0633>; email: [Yvonne.opanga@amref.org](mailto:Yvonne.opanga@amref.org)

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Neonatal sepsis contributes to increased rates of mortality among newborns during their first month of life. Chlorhexidine (CHX) has proven effective in the prevention of neonatal sepsis due to umbilical stump infection after birth. Despite shifting from dry cord care techniques to CHX use, there is still a high prevalence of improper cord care in low-resource settings in Kenya. This study sought to explore barriers and enablers to CHX use in Kwale, Vihiga and Machakos counties in Kenya. We adopted mixed methods cross-sectional survey with 582 women of reproductive age with a young child less than one year as respondents to the quantitative survey. Qualitative data entailed thirty (30) key informant interviews with healthcare workers and national policymakers. Six (6) focus group discussions with mothers, caregivers, community health volunteers (CHVs) and traditional birth attendants were conducted. An observation checklist was used to assess the availability of CHX services and supplies in fourteen (14) health facilities was conducted. Results indicated variation in umbilical cord care practices for newborns across counties. Of 582 caregivers, only 1.3% reported having ever used CHX. Majority mentioned using methylated spirits (41.6%), other antiseptics (23.3%) and salty water (11.3%). Other substances used for cord care included plain water, herbal extracts, cow dung, soil, and breast milk. Despite 100% awareness of CHX among health workers, only a third of caregivers (38.7%) had heard of CHX. About 76.9% of participants preferred the gel formulation

and 8.9% did not know where to get the product. Drivers of CHX use included faster cord healing, infection control in hospitals, ease of use, cost implications, ease of access, influence from key decision makers and preferred CHX formulation. Barriers included minimal awareness among caregivers, cultural practices and taboos on cord care, inadequate capacity building of CHVs on CHX, unclear CHX user guidelines for caregivers, prolonged stockouts and inadequate knowledge of CHX in communities. Healthcare workers highlighted poor dissemination of CHX guidelines by the Ministry of Health, unavailability in the Kenya Medical Supplies Authority (KEMSA) and Mission for Essential Drugs and Supplies logistic management information system making it difficult to procure. There is a need for advocacy to promote the uptake of CHX in facilities and increase knowledge of communities on CHX as well as manage the supply chain to increase CHX availability.

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## INTRODUCTION

The neonatal period is the most vulnerable time for a child's survival (UNICEF, 2019). The average global neonatal mortality rate of 17 deaths per 1000 live births was reported in 2019 (UNICEF, 2019). Poorer parts of the world including sub-Saharan Africa and South Asia experience higher rates of neonatal mortalities compared to other parts of the globe (Masaba & Mmusi-Phetoe, 2020). In sub-Saharan Africa for example, approximately 28

deaths per 1000 live births were reported in 2018 (Masaba & Mmusi-Phetoe, 2020). World Health Organization (WHO) estimates neonatal mortality stands at 21.4 deaths per 1,000 live births as of 2019 (WHO, 2019). A systematic review of neonatal mortality rates in Kenya and South Africa indicated a decline from 35.4 deaths per 1000 live births in 1975 to 19.6 deaths per 1000 live births in 2018 (Masaba & Mmusi-Phetoe, 2020). Most neonatal deaths result from preterm birth complications followed by intrapartum-related events.

Neonatal sepsis is the major cause of mortality and morbidity globally, particularly in developing countries. A meta-analysis and systematic review of neonatal sepsis in developing countries indicated that it is still a major public health problem in lower and middle-income countries reporting a high pooled prevalence of neonatal sepsis which accounted for a third of the neonates (Amare et al., 2019). Neonatal sepsis contributes to 17% of death in Sub-Saharan Africa as compared to 6% in developed countries (Gebremedhin et al., 2016). In Kenya, over 15% of newborn deaths are attributed to neonatal sepsis. Although this number has declined in recent years, this decline has been very small: no more than 2% in the last five years. Research has demonstrated that neonatal sepsis is linked to poor antenatal clinic attendance, prim parity, low socioeconomic status of mothers and caregivers, poor hygiene practices, persistent home deliveries, and a lack of awareness of existing preventative measures (Amare et al., 2019; Moraa et al., 2019a; Stewart et al., 2016). Approximately 5.29-8.73 million Disability Adjusted Life Years (DALYs) are lost annually across the continent as a result of neonatal sepsis (Ranjeva et al., 2018).

Sepsis in neonates has a variety of causes including an infection of the umbilical cord. Omphalitis, which is a leading cause of neonatal sepsis occurs as a result of an infected umbilical cord by Gram-positive and -negative bacteria, e.g., *S. aureus* and *E. coli*. The umbilical cord can be a pathway for bacterial infection and death if appropriate Care is not maintained (Coffey & Brown, 2017). Optimal cord care practices for newborns in the first few days of life, especially in poor settings, rural populations, and amongst women with low educational levels, have the increased potential to avoid these preventable neonatal deaths. Changes in guidelines for newborn umbilical cord care practices have been observed over time (Muriuki et al., 2017). However, developing countries seem to be struggling to adjust to these changes evidenced by the use of a variety of cleansing agents including antimicrobial treatment, dry umbilical code care practices, and the use of alcohol-based solutions or antiseptics (Muriuki et al., 2017). A study conducted in a primary care facility in Kenya's Capital indicated that commonly used agents were surgical spirit, chlorhexidine, and antimicrobials. The study also indicated the use of airdrying, ash or

saliva among mothers, practices that predispose neonates to infections (Moraa et al., 2019a).

Substantial research has demonstrated that it is possible to prevent and treat neonatal sepsis using Chlorhexidine (CHX). For instance, community-based randomized trial research conducted in Nepal showed a statistical significance in the reduction of neonatal mortality by 24% among the group receiving CHX compared to dry cord care practices. The impact on mortality was stronger among infants who received cleansing within 24 hours of birth (RR = 0.66 [0.46, 0.95]). CHX is a lifesaving liquid solution or gel disinfectant and antiseptic used to also treat conditions including mouth ulcers, yeast infections and gingivitis, as well as being used for cord care (Sankar et al., 2016). In 2013, the WHO included CHX in its essential medicine list (Health et al., 2016). In Kenya, the Ministry of Health issued guidelines in 2016 which recommended using 4% CHX for cord care (Health et al., 2016; Muriuki et al., 2017). It is estimated that up to one million newborns across Kenya could benefit from increased access to and utilization of CHX, particularly for infants born at home who cannot access health facilities (Muthwii, 2017).

In 2016, the use of CHX was introduced in healthcare facilities in Kenya (Ambale et al., 2019; Health et al., 2016), and research conducted in Bungoma county shows high acceptability of CHX use among caregivers and healthcare workers (Muriuki et al., 2017). The introduction of CHX was, however met with mixed reactions (Ambale et al., 2019). While the use of CHX as a lifesaving commodity in infant cord care is widely documented and strongly supported as a safe, effective, and affordable intervention to prevent neonatal sepsis, awareness of its availability, correct use, and associated benefits is still very limited amongst mothers, caregivers, and healthcare workers. There remains very low effort in operationalizing the policies that can strengthen the distribution and utilization of CHX for umbilical cord care. Furthermore, there has been reported ambiguity in the packaging of the various products of chlorhexidine that makes it difficult to uniquely identify the formulation strength. This study, therefore, sought to 1) Explore the specific barriers and enablers to the utilization of CHX as a method of cord care amongst healthcare providers and

mothers/caregivers, 2) Identify the barriers and enablers to the efficient distribution of CHX to mothers/caregivers and healthcare providers at different levels of the supply chain process, and 3) Assess the knowledge and awareness levels amongst healthcare providers and mothers/caregivers on CHX as a method of cord care.

## MATERIALS AND METHODS

The study adopted a mixed methods descriptive cross-sectional design conducted in 3 counties including Vihiga, Kwale, and Machakos counties. Msambweni, Hamisi, and Kathiani sub-counties were selected in Kwale, Vihiga, and Machakos counties, respectively. The counties and sub-counties were purposively selected due to reported high numbers of facility deliveries. Quantitative data was collected through household surveys among 582 women/caregivers of reproductive age with a young child less than one year. Thirty (30) key informant interviews and six (6) focus group discussions were utilized to collect qualitative data. A facility observation checklist was used for collecting facility-based data. For the survey, households that had a woman of reproductive age (15-49 years) with the youngest child aged less than one year were included.

The sample size was calculated using this Cochran formula where  $p$  is the proportion of the mother who had used CHX during their last delivery, which equals 50% (the study assumed 50% since no similar study had been documented in three counties);  $Z^2$  was the desired confidence level,  $1 - \alpha$ , which equals 95% = 1.96;  $e$  is the desired level of precision at 0.05 and a design effect of 1.6. A minimum of 576 women of reproductive age with a young child less than one-year-old were proportionately distributed across the 3 counties. Eight Community Units (CU) were randomly selected in each of the sub-counties. The Community Health Extension Worker (CHEW) responsible for the selected CUs provided a list of all households in the CU with a baby of less than one year. The Community Health Volunteers (CHVs) responsible for the selected household were then contacted and asked to accompany the research team to the selected households. Quantitative data was collected electronically using Open Data Kit

Software. The structured questionnaire covered topics such as CHX awareness, access, and use. The tool was translated into local languages to improve comprehension and increase the response rate. All quantitative data collected was uploaded to the Amref server daily. Afterwards, it was downloaded in an MS Excel spreadsheet and stored on a password-protected computer for cleaning. Back-up copies were stored on an external hard drive which is in the sole custody of the Amref Health Africa statistician. Data was analysed descriptively using univariate analysis. This involved frequency distributions for categorical variables and descriptive statistics (means, medians, standard deviations) for continuous variables. Categorical variables (e.g., uptake of CHX, etc.) are presented using bar charts, pie charts, and frequency distribution tables. Statistical Package for Social Sciences (SPSS) version 22 was used for data analysis, while MS Excel was used to create charts and graphs.

For qualitative data, purposive sampling was used to identify a mix of key informants. These included six pharmacists, three paediatricians, one gynaecologist, one medical officer, one clinical officer, two procurement officers, 14 nurses with different titles (Commodity Nurse, Reproductive Health Coordinators, Reproductive Health Nurse, Midwife, Neonatal/paediatric Nurse, County/Sub County Nurse, Nurse Coordinator and Facility Nurse or Nursing Officer) and one policy maker at the national level. A total of six Focus Group Discussions (FGDs) were conducted with mothers, Birth Companions (formerly Traditional Birth Attendants (TBAs)) and CHVs. Key informant interviews (KIIs), FGD guides and observation checklists were used to collect qualitative data. Each interview was conducted by two research assistants, with one being a moderator/interviewer and the other a note-taker. All interviews were audio recorded with prior informed consent from participants. The interviews were transcribed verbatim and translated where appropriate, coded and analysed for themes and patterns. A coding framework was initially developed using the research questions and interview guides. It was then refined during coding by adding emerging themes. The coding framework was then used to code all the transcripts using NVivo 11 Pro software. Qualitative data has been reported using narratives



and verbatim quotes. Qualitative data were triangulated with quantitative data.

For the facility assessment, an observation checklist was used to assess the availability of services and supplies related to CHX use in 14 health facilities. The facilities were randomly selected from a list provided by the respective county governments. A mix of 14 health facilities from the three counties was selected for observation on supply and practices related to CHX. The facilities were selected and sampled based on the Kenya Essential Package of Health (KEPH) level, that is, Level 5, Level 4, Level 3, and Level 2, all of which conduct deliveries. In each of the counties, 1 referral hospital (level 5), 2 sub-county hospitals (Level 4), 1 Health Center (Level 3), and 1 private hospital. A checklist with three measures, ranging from 0 to 2, where 0 meant

the facility did not meet that Ministry of Health (MoH) standard and two meant that the facility met the standard fully was used to collect data from 14 health facilities in Machakos (6), Kwale (6), and Vihiga (2). In Vihiga County, two sub-county hospitals that gave permission to be assessed were included.

## RESULTS

### Sociodemographic Characteristics

A total of 582 women of reproductive age with a mean age of 28 years were interviewed. The majority of participants had a child aged 1-3 months (29.4%) and had received either primary (47.8%) or secondary (36.9%) education, as indicated in *Table 1*.

**Table 1: Sociodemographic characteristics of respondents**

Characteristics		Total (n = 582)	Kwale (n = 194)	Vihiga (n = 193)	Machakos (n = 195)
Level of education (n = 582)	None	48 (8.2%)	43 (22.2%)	5 (2.6%)	0
	Primary	278 (47.8%)	120 (61.9%)	85 (44.0%)	73 (37.4%)
	Secondary	215 (36.9%)	29 (14.9%)	82 (42.5%)	104 (53.3%)
	Tertiary	41 (7.0%)	2 (1.0%)	21 (10.9%)	18 (9.2%)
Age	Age (Mean (min, max))	28 (15, 45)	28 (17, 43)	28 (15, 43)	28 (17,45)
	Age of baby				
	<1 month	39 (6.7%)	14 (7.2%)	11 (5.7%)	14 (7.2%)
	1-3 months	171 (29.4%)	54 (27.8%)	59 (30.6%)	58 (29.7%)
	4-6 months	141 (24.2%)	48 (24.7%)	47 (24.4%)	46 (23.6%)
	7-9 months	130 (22.3%)	40 (20.6%)	43 (22.3%)	47 (24.1%)
	10-12 months	101 (17.4%)	38 (19.6%)	33 (17.1%)	30 (15.4%)

### Code Care Cleaning Practices

A total of 476 (81.8%) of respondents interviewed reported to have cleaned their babies' cords every day immediately after birth. When asked about the

substances they used to clean the cord, 198 (41.6%) and 111 (23.3%) indicated that they used alcohol/spirit and other antiseptics, respectively. Only six (1.3%) respondents reported having used CHX. Other substances used included plain or salty water and herbal extracts, as illustrated in *Table 2*.

**Table 2: Code care cleaning practices**

Variable	Description	Total (n=582)	County		
			Kwale (n=194)	Vihiga (n=193)	Machakos (n=195)
Cleaning Cord Everyday	Yes	476 (81.8%)	164 (84.5%)	160 (82.9%)	152 (77.9%)
	No	106 (18.2%)	30 (15.5%)	33 (17.1%)	43 (22.1%)
Substances used for cleaning and Care	Alcohol/spirit	198 (41.6%)	93 (56.7%)	18 (11.3%)	87 (57.2%)
	Antiseptic	111 (23.3%)	22 (13.4%)	32 (20.0%)	57 (37.5%)
	Salty water	54 (11.3%)	14 (8.5%)	34 (21.3%)	6 (3.9%)
	Herbal extract	26 (5.5%)	2 (1.2%)	24 (15.0%)	0
	Honey	1 (0.2%)	1 (0.6%)	0	0
	Nothing	14 (2.9%)	1 (0.6%)	12	1 (0.7%)
	Water	59 (12.4%)	16 (9.8%)	40 (25.0%)	3 (3.0%)
	Coconut Oil	13 (2.7%)	13 (7.9%)	0	0
	Chlorhexidine	6 (1.3%)	5 (3.0%)	0	1 (0.7%)
	Other	17 (3.6%)	6 (3.7%)	5 (3.1%)	6 (3.9%)
Ever heard about CHX	Yes	225 (38.7%)	53 (27.3%)	97 (50.3%)	75 (38.5%)
	No	357 (61.3%)	141 (72.7%)	96 (49.7%)	120 (61.5%)
Previously heard of CHX	Yes	53 (27.3%)	97 (50.3%)	75 (38.5%)	225 (38.7%)
	No	141 (72.7%)	96 (49.7%)	120 (61.5%)	357 (61.3%)

The use of alternative substances was supported by the views of many respondents in the FGDs. Although the majority agreed that the cord must be cleaned every day from the time the child is born to prevent getting infected, the use of substances other than CHX was still common.

*“... according to our traditions which we started a long time ago, we understand that the stump should be tied after delivery and applied for traditional medicines and after it heals quickly the newborn is in good health and lives his/her childhood well...”* CHV FGD Participant, Vihiga

Some of the key informants reported that Chlorhexidine is often used interchangeably with methylated spirit, especially during stockouts.

*“Majorly, it is CHX gel and previously or when it is out of stock people use spirit which is not really very professional”.* Key Informant, Healthcare Worker, Vihiga

Other common products for cord care highlighted during focus group discussions include baby powder, baby oil, cow dung, coconut oil, soot, soil, and even breast milk.

## Knowledge, Awareness and Practices on Chlorhexidine Use

### Caregiver Awareness

To assess the chlorhexidine level of awareness, caregivers were asked if they had ever heard about the product. Only 225 (38.7%) reported having heard about chlorhexidine with the majority of them residing in Vihiga County (50.3%). This view was corroborated during FGDs with caregivers.

*“I have heard about it today, what I can say is that we need it, we have heard how it’s used and it will help our children, so we need it in plenty because once we know when you educate the mothers, you have educated the entire community”* FGD, Caregivers

All the respondents who reported having ever heard about Chlorhexidine had an idea what it was with the majority of them referring to it as *“Dawa ya kitovu”* - a Swahili expression for medicine used to treat the cord

While some of the caregivers interviewed in the FGDs demonstrated that they know CHX through their descriptions, the majority could not specifically remember the name or mention any

agreed local name. It is interesting to note that the majority of those who had heard of CHX are from Vihiga County 97 (50.3%) – as opposed to 75 (38.5%) in Machakos and 53 (27.3%) in Kwale.

*“They used drugs given from the hospital but cannot remember the name; it was a watery drug in a bottle. After bathing the baby, you apply it”* Caregiver FGD participant, Kwale

### **Health Worker Awareness**

All healthcare providers demonstrated high awareness of CHX during their KIIs. The Key Informant at the national level provided a chronological account of how the government adopted the use of CHX in cord care and how it was introduced in the essential medicine list and registered by pharmaceutical companies. Healthcare providers also reported that while KEMSA was given the mandate to procure CHX for distribution to the hospitals, this never occurred until organizations such as PATH and UNICEF supported its distribution to the county hospitals.

*“First of all, let us go a little bit back; when it comes to application, it needs to be applied as immediately as possible after cord cutting, eh? Yeah. And then we advocate it is once a day, for the next seven days or until the cord drops, yeah. The reason why we advocate for that is to minimize any application of any other substance on the cord....”* KII\_National/County

Many of the Healthcare workers interviewed reported a positive perception by the caregivers relating to CHX including the fact that it is easy to use; however, some providers reported that with the application of CHX, the cord takes longer to heal.

*“They have accepted it, with few complaints that it takes a long time to heal when you use it”.* KW\_KII\_HCP

There was general agreement among the key informants that the use of CHX 7.1% is the current method of cord care. The majority of the key informants said that CHX gel or solution should be applied for 7 days or until the cord falls off.

*“Yes, then, currently, we advocate for the use of 7.1 chlorhexidine which should be applied as immediately as possible”.* KII\_National/County

### **CHV/TBA Awareness**

Some of the CHVs and TBAs interviewed demonstrated a sufficient understanding of the CHX application procedure.

*“The procedure is that before you open the bottle, you wash your hands and dry them using tissue paper, when you start applying, you start at the side, you apply the upper part of the stump first secondly, apply on the stump itself thirdly apply on the lower part of the stump and finally apply on the round bottom part”.* TBA/CHV FGD Participant, Vihiga

### **Enablers of Utilisation of CHX**

#### ***Speed of Healing and Ease of Use***

A few caregivers reported that when instructions are followed correctly, CHX heals the cord very fast. They added that it can take just three days for the cord to heal and that the drug was also easy to use and effective:

*“I was given CHX when I was coming for clinics. So, when I started, I was told how to use it, and I think if you follow instructions, it is simple and easy to use and dries the cord by the third day. On the third day, the cord usually falls off, and you are not stressed by it (anymore)”.* TBA/CHV FGD Participant, Vihiga

#### ***Low Cost of CHX***

The majority of the respondents stated that CHX costs less than 40 shillings both at private health facilities and the pharmacy. It is available for free in public health facilities. During the FGDs and KIIs, it was noted by one interviewee that CHX is sometimes available in health facilities and offered for free. Another participant also added that when the drug is not available in hospitals, it can be bought from the local pharmacy at an affordable price. In addition, a key informant added that positive feedback from a client that has used the

product could be used to encourage others to use it as well.

*“CHX is mostly free. You do not buy, maybe occasionally if it is not available at the hospital, then you would have to buy, and it is cheap”.*  
TBA/CHV FGD Participant, Vihiga

### **Barriers of Utilisation of CHX**

#### ***Inadequate Education and Low CHX use***

Most of the caregivers reported that they had never heard about CHX prior to the interviews. This is supported by the FGDs with caregivers – one respondent stated that although they had also not heard of CHX, they were excited about its potential:

*Most of us do not know it because we have never been told about the drug, they tell us to use spirit, they do not tell us there is a drug we are supposed to buy” - TBA/CHV FGD Participant, Machakos*

Interviews with health workers seem to support this. One of the participants added that this could be influenced by the size of the counties; it could be hard for educators to reach people across the different counties with information on CHX.

*“Counties are now, we are now on the scale-up plan; initially, you could say we are piloting, isn't it? Then we moved to scale up to all 47 counties, right? Some communities are so vast, eeh, because you might reach the county headquarter level... so the information might not have reached a lower level, right? That is one, so when the HCP at the lowest level has not really understood what chlorhexidine is, THAT results in the wrong use, isn't it?”*  
KII\_National/County

#### ***Effect of CHX on the Cord***

Some of the healthcare workers complained that the gel leaves the cord wet which delays the healing process therefore prefer to use spirit.

*From my own personal experience, I think it delays falling off because when you apply the gel, it keeps the cord wet, so the cord takes longer to fall off compared to surgical spirit. I used chlorhexidine for the first week, and the*

*cord did not fall off; then I went to a certain paediatrician, and he told me to buy a surgical spirit and for sure the cord fell off after two days and the surgical spirit kept the cord dry compared to chlorhexidine. – MKS\_KII\_HCP*

#### ***Poor Sensitisation of Health Workers on the Use of CHX***

Further, poor sensitization on the use of CHX among healthcare workers and caregivers has led to incorrect use of the gel; thus, the cord takes longer to heal. Most healthcare workers reported high awareness levels, although they had not been sensitized on how to use it.

*“Currently, it is something that I have seen, but I was never sensitised about it. The CHX use on the umbilical cord for newborns, but previously we used to use spirit to swab and that is the much I have been doing”* KW\_KII\_HCP

*Well, I do not think all healthcare workers are aware of chlorhexidine use and exactly how to use it so what I have seen is people have it in their stock and it is not being consumed in some facilities – MKS\_KII\_HCP*

#### ***Lack of Availability of CHX in Healthcare Facilities***

During FGDs with caregivers, most of them reported that CHX is unavailable in facilities and they cannot afford the drug at the local pharmacies. One of the key informants added there are inadequate resources allocated to purchase CHX. They encouraged massive sensitization on benefits and the need to procure CHX.

#### ***Community Sensitisation***

Some of the health workers interviewed demonstrated an understanding of the CHX application procedure:

*“The procedure is that before you open the bottle you wash your hands and dry them using tissue paper, when you start applying, you start at the side, you apply the upper part of the stump first; secondly, apply on the stump itself; thirdly apply on the lower part of the stump and finally apply on the round bottom part”.*  
TBA/CHV FGD Participant, Vihiga



However, contradictorily, it is also likely that a lack of sensitization on the use of CHX among both healthcare workers and caregivers exists, as the majority of healthcare workers reported high awareness levels but a lack of understanding of how CHX should be used:

*“I think the healthcare worker, they have to be convinced because the truth is I know we still have a certain number percentage who are not convinced that chlorhexidine works and then because they’re the same ones who are going to influence the mother....”* KII\_National/County

To increase the uptake of CHX, two participants suggested that mothers and caregivers should be sensitized on the importance of cord care since the majority of them follow the instructions given by healthcare providers.

*“We should educate mothers on the importance of cord care and also we educate them on the right commodity of the right drug to use for cord care”. VH\_KII\_HCP*

*“A. Ok, personally I will only advise that there are a lot of sensitizations in the community on the use of CHX for cord care. Sometimes even the mothers are surprised when you give them the CHX. Such you have to educate them; you have to tell them what it is for because they have their own methods of taking Care of the cord...”*  
KW\_KII\_HCP

### **Traditional Views, Taboos, and CHX**

In an effort to understand the existing barriers to the use of CHX for cord care, caregivers were asked whether they were aware of any taboos regarding umbilical cord care in their respective communities. Generally, 49.3% (287) of the respondents stated they did not know of any taboos related to umbilical cord care. However, an array of beliefs and taboos were stated across the three counties. A common belief amongst respondents from Kwale County was that the dried cord should not be allowed to fall on the private parts, especially for a male child, since this would lead to infertility.

*“...that when caring for the cord before it drops one should make sure not to fall on the private parts or else that child will not be fertile*

*or sustain an erection, if it’s a boy”* (KW-FGD-Care Givers)

FGDs and KIIs participants gave a range of beliefs and taboos including not touching the cord before it falls off, not bathing the baby before the peg falls off, applying saliva on the cord, splashing breast milk on the cord, applying Sodom apple, soil, suck the umbilical cord with their mouth, sleep with the baby until the cord heals, or not allowing others to hold the baby before the cord heals, among others. The use of alternative substances was supported by the views of many respondents in the FGDs:

*“... according to our traditions, which we started a long time ago, we understand that [with] the stump, we wait – it should be tied after delivery and applied for traditional medicines and after it heals quickly the newborn is in good health and lives his/her childhood well...”* TBA/CHV FGD Participant, Vihiga

### **Negative Opinions of CHX**

Further, while many of the healthcare workers interviewed reported a positive perception by the caregivers concerning CHX, some providers reported that with the application of CHX, the cord takes longer to heal. In this way, some of the healthcare workers complained that CHX leaves the cord wet which delays the healing process and that they prefer to use the spirit:

*“Counties are now, we are now on the scale-up plan. Initially, you could say we are piloting, isn’t it? Then we moved to scale up to all 47 counties, right? Some communities are so vast, eeh, because you might reach the county headquarter level...so the information might not have reached a lower level, right? That is one, so when the HCP at the lowest level has not really understood what chlorhexidine is, THAT results in the wrong use, isn’t it?”*  
KII\_National/County

This relates to community beliefs – one of the perceptions is that the application of wet substances makes it harder for the cord to dry and fall off.

*“The perception that they have is the cord when you treat the cord with some of these substances it takes too long to fall off...that people still feel*

*that when something wet is applied to the cord, it keeps even wet and takes even too long to dry and fall off....” KW\_KII\_HCP*

### **Type of CHX Product**

More than two-thirds (76.9%) of the respondents preferred the gel formulation of CHX, 21.3% the solution, and only 1.8% preferred both. However, it was noted that information from key decision influencers in the community and health workers also determines the choice of cord care products to be used, with most mothers being likely to follow the instructions given at the health facility.

*“The choice is driven by the, it is just driven by the health workers how they guide. It is driven by the guideline that is maybe we follow the guideline to take care of the same”.* VH\_KII\_HCP

There was general agreement among the key informants that the use of CHX 7.1% is the current method of cord care.

*“Yes, then, currently, we advocate for the use of 7.1% chlorhexidine which should be applied as immediately as possible”.* KII\_National/County

### **Access to CHX**

Among the respondents who mentioned that they had ever heard about CHX, 84% (189) mentioned that an individual could get CHX from the facility, 13.3% (30) at the chemist, and 8.9% (20) did not know where someone can get the commodity.

A common view among health providers was that the currently available volumes of CHX are not enough for the standard recommended dosage.

*“...the ten-gram tube is not enough for the mothers, okay...it might get used up in maybe two days...”* KII\_National/County

### **CHX Guidelines**

This study sought to find out whether health workers were aware of any MoH guidelines on the use of CHX for umbilical cord care products and how the implementation of these guidelines affected the uptake of CHX. Awareness regarding CHX guidelines was high among healthcare workers, but

the majority reported sub-optimal dissemination of the guidelines. One health worker mentioned that he educated himself about CHX through the internet. Another mentioned that they were verbally informed about CHX. Sensitization on the correct use of CHX among healthcare workers was also emphasized since this would trickle down to the clients.

*“...but what I know as a supervisor, it’s my role to ensure that guidelines are disseminated to the healthcare providers, especially those at ground levels then they should be able to give proper information to the clients so that CHX may be used according to the laid down guidelines”* – KII\_National/County

### **Pharmacovigilance**

The study sought to find out whether there were any adverse events reported from the use of CHX. The results show that there were no major adverse events reported with only a few clients reporting side effects such as rashes, redness, and irritation, as explained by one of the key informants;

*“... somebody came, when we were starting the use of Chlorhexidine complaining they had seen a like reddish colour around the cord...it was not that serious, and it just subsided, so I have never received any major side effect on the use of CHX”* KII\_National/County

However, as has been widely reported [1], there have been cases where mothers have accidentally used the chlorhexidine cord care gel as an eye ointment. Many of the health workers interviewed were aware of this, either through word of mouth or via the directive given by the MoH.

*“...I heard an incident where a mother confused it with the eye ointment and there was a lot of irritation and they came back to the hospital”.* – KII\_National/County.

The Ministry of Health at the national level was reported to be working on solutions that can prevent such occurrences, as reported by one of the key informants. The upcoming stakeholders meeting will enable Amref to gain more information on this from the MoH and on the way forward in terms of handling this issue.

*“...that is why I am saying, the meeting of the next month, eeh? We are inviting the division of ophthalmic services, eeh? They will be sharing- these are some of the things that were not anticipated; a lot of information will be shared during that particular day”.* KII\_ County/National

### Supply Chain Management

Initial donations from implementing partners provided a boost to the availability of CHX. This is best attributed to key informant interviews where implementing partners provided health workers with free samples which would be used at the health facilities.

*Currently, we have not been procuring: what we have is what was donated after training; otherwise, it (CHX) is not in the LMIS (Logistic Management Information System) in KEMSA and in MEDS, we did not have it in their list.* MKS\_ KII\_ National/County

The above contradictory statements introduce supply chain management factors that impede the optimal uptake of CHX. On the one hand, one provider mentions that CHX is included in the essential list of medicines, while another mentions that CHX is not listed in the LMIS system, making it difficult to procure the drug from both the government and private entities that mainly supply drugs to the hospitals.

Stockouts of CHX at the health facilities were also attributed to a lack of funds to procure CHX

*“I wouldn't say there is any policy or law that hinders us, but possibly the availability of finance in order to procure this item and secondly availability of the item at KEMSA itself, a times if they don't have then they don't supply”* MKS\_ KII\_ National/County

It was also noted that sometimes CHX is available at the health facility, but healthcare providers do not always use it due to minimal sensitization on the use of CHX as part of essential newborn care interventions. This is a major barrier to the uptake of CHX because health workers are expected to counsel women during Antenatal Care (ANC) and

post-natal Care on the importance of using CHX for cord care.

*“Well, I do not think all healthcare workers are aware of chlorhexidine use and exactly how to use it so what I have seen is people have it in their stock and it is not being consumed in some facilities.* KII\_ National/County

### DISCUSSION

This study highlights enablers and barriers of chlorhexidine use from the perspectives of caregivers, healthcare workers, and policymakers in three counties reporting high birth rates in Kenya. The Ministry of Health in Kenya recognizes 7.1% chlorhexidine for newborn cord care and has included it in the essential medicines list. Further guidelines for the use of Chlorhexidine for newborn umbilical cord care were developed to guide healthcare workers. These efforts, however, seem not to have paid off since this study indicates that among 582 caregivers, only 1.3% report having used or are currently using chlorhexidine in the selected counties. The most commonly used products as reported by participants, included methylated spirit and antiseptics. Additionally, dry code care practices were also reported. Other substances which could predispose a neonate to sepsis including plain water, herbal extracts, baby powder, baby oil, cow dung, coconut oil, soot, soil, and even breast milk, were also being used.

The fundamental question is therefore why the uptake of Chlorhexidine was minimal in counties that experience high cases of births across the country. The findings were consistent with a study conducted in Pumwani which indicated that more than half (55%) of caregivers use airdrying (Kinanu et al., 2016). Similarly, a descriptive cross-sectional study on the assessment of chlorhexidine use in Kangundo Level 4 hospital in Kenya showed mixed cord care practices among respondents. Feedback from the focused group discussions indicated that respondents felt the methylated spirit was more effective than CHX, lack of use of the CHX Gel in maternity immediately after birth as recommended and no clear instructions on how to apply the gel coupled with the erratic supply of gel leading healthcare facilities to opt for spirit (Ambale et al., 2019) contributed to minimal uptake. Similarly, a

case-control study to assess umbilical care hygiene and neonatal sepsis relationship in a primary healthcare facility in an urban setting found that Chlorhexidine/surgical spirit were used for cord care among 79.2% of caregivers in the control group compared to 35.6% of the cases (Moraa et al., 2019a).

The proportion of mothers with improper hygiene was 35.3% (Moraa et al., 2019b). A study in Nepal and Bangladesh observed high (71.5%) “don’t know” replies from women reporting on the application of CHX to their newborn’s umbilical cord (Mallick et al., 2019; Zaman et al., 2021) despite evidence from a systematic review showing the protective benefit of newborn skin and umbilical cord cleansing with chlorhexidine in similar communities in south Asia (Mullany et al., 2006). In Ghana and Nigeria, the methylated spirit is the main cord care product used, while in Benin, 81% of caregivers reported using inappropriate substances (Abegunde et al., 2017; Abhulimhen-Iyoha et al., 2011; Abhulimhen-Iyoha & Ibadin, 2012; Agossou et al., 2016). Evidence from low- and middle-income countries in sub-Saharan Africa and Asia indicate mixed cord care practices, among them some of which may be harmful predisposing neonates to sepsis (Milton et al., 2022; Moraa et al., 2019c). There is therefore need for more awareness and advocacy strategies to increase the uptake of better cord care practices including the use of CHX, which has proved to lower umbilical cord sepsis.

It was evident from the study that some of the key drivers for CHX use include clear effectiveness of CHX among caregivers, which means that mothers who have used CHX have demonstrated faster cord healing and infection control, ease of use, cost implications, ease of access, well informed key decision influencers (mother-in-law, husband, health providers etc.), and choice of preferred CHX formulation. This was also evidenced in a quasi-experimental study to assess the level of acceptability of CHX among 480 mothers with newborns enrolled on CHX; 480 were not using CHX and providers in Bungoma. Approximately 99% of mothers dispensed with CHX used it, while 94% of them were very satisfied compared to prior cord care practice. 93% of non-users indicated a future use. 65% of users reported having recommended its use, and 92% indicated they

would recommend it. The use of CHX gel for umbilical cord care was highly acceptable to mothers and providers in communities where the program was implemented (Githinji, 2018). In low-resource settings similar to those targeted in this study, it is therefore important for implementors to take key note of the enablers and incorporate them when designing programs to improve the uptake of CHX use in healthcare facilities.

Barriers to CHX use included minimal awareness about the product among caregivers, cultural practices and taboos on cord care, inadequate capacity building of health providers and CHVs on the importance and use of CHX, unclear CHX use guidelines for caregivers, prolonged stock outs and inadequate knowledge amongst other community figures. The study also indicated that despite key informant interviews revealing that CHX awareness among health workers was high (100%), this did not translate to knowledge about the product within the community because only a third of caregivers (38.7%) had heard of CHX. Additionally, the majority of the caregivers in the FGDs reported that they had never heard of CHX. Some of the challenges explained by healthcare workers included the vastness of counties with a lack of adequately trained workers to cover the whole county. Poor sensitization on the use of CHX among healthcare workers and caregivers has led to incorrect use of the gel; thus, the cord takes longer to heal. The majority of healthcare workers reported high awareness levels but a lack of understanding of how CHX should be used. Some of the healthcare workers complained that CHX leaves the cord wet which delays the healing process, and that they prefer to use the spirit. Information from key decision influencers in the community and health workers also determines the choice of cord. Other barriers included poor dissemination of the guidelines in terms of following the level of detail needed for full effectiveness and unavailability of the product in the Kenya Medical Supplies Authority (KEMSA) and Mission for Essential Drugs and Supplies (MEDS) logistic management information system, making it difficult to procure.

A study conducted among healthcare providers indicated that the use of CHX gel for cord care in neonates is likely to be acceptable to healthcare workers in settings with a high prevalence of



neonatal morbidity and mortality arising from cord infections (Muriuki et al., 2017). This was because of some of the benefits noted including fast healing of the cord as reported by mothers, minimal side effects, reduced newborn infections based on what their records showed and mothers' reports, ease of use that made it simple for them to counsel mothers on how to apply it, positive feedback from mothers which demonstrated satisfaction with the medication, and general acceptance of the medication by the community (Muriuki et al., 2017). The study however highlighted that to ensure maximum uptake; there is a need for sensitization of the community and follow-up of caregivers to ensure appropriate use. Additionally, there is a need to address aspects of human resources, adequately train staff on the guidelines and ensure a constant supply of medications in healthcare facilities.

Therefore, it is evident from this study that to improve the uptake of CHX in healthcare facilities in Kenya, it is important to 1) Disseminate chlorhexidine guidelines to all counties to improve the demand and supply of product, thereby reducing the evidence to practice gap, 2) Train service providers are a key element for driving demand for CHX. This study's findings show that service providers have a significant influence on caregiver's choice of cord care substance; hence they should be utilized as the main entry point for conveying chlorhexidine messages to expectant mothers, 3) Ensure Chlorhexidine availability through sustainable procurement processes to reduce regular and large scale stockouts of the product at the health facility. 4) Disseminate clear messages on CHX at the community level to address myths and misconceptions about cord care and improves awareness and knowledge of cord care among community members. In terms of effectiveness, the messages should emphasize that CHX heals the cord stump faster and is effective in sepsis prevention.

## CONCLUSIONS

Despite the shift from the previous Ministry of Health recommendation to practice dry cord care to using Chlorhexidine as an effective intervention for the reduction of neonatal mortality and prevention of infection, harmful practices related to cord care such as the application of cow dung and other

substances that may increase risk of infection to the cord are still prevalent. Chlorhexidine awareness among healthcare providers is relatively high, but awareness and use are still low at the community level. In addition, guidelines for the use of Chlorhexidine for newborn umbilical cord care in Kenya were developed in April 2016. However, these guidelines have not been adequately disseminated to the counties, as a result, service providers reported insufficient knowledge of the guidelines' content. As much as Chlorhexidine has been included in the country's Essential Medicines List, stockouts in health facilities are still common and sometimes can last up to one year. This poses a major threat to the scale-up of the product in the country and, subsequently, to the reduction of neonatal mortality due to sepsis. Key interventions that can be implemented to overcome barriers to chlorhexidine uptake include advocacy activities, capacity building of health providers and community health volunteers, community mobilization and testimonials. A concerted effort is required from all stakeholders to address the policy implementation gap in the use of Chlorhexidine.

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