

Maternal Perceptions and Umbilical Cord-Care Practices Using Chlorhexidine 7.1% and their Association with Clinical Presentation of Neonatal Sepsis among Newborns in Vihiga County, Kenya

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Abstract: ***Background:** Neonatal sepsis remains an important contributor to newborn morbidity and mortality in sub-Saharan Africa. Appropriate umbilical cord care may reduce infection risks, but chlorhexidine utilization depends on maternal awareness, acceptability, and cultural practices. **Objective:** To assess maternal awareness, acceptability, cultural practices, and utilization of chlorhexidine cord care and their associations with reported neonatal sepsis symptoms in Vihiga County, Kenya. **Methods:** An analytical cross-sectional study using quantitative and qualitative approaches was conducted among mothers with newborns. Of 378 targeted mothers, 345 completed interviews. Data were collected using structured questionnaires and key informant interviews. Logistic regression was used to examine associations between cord care practices and reported neonatal sepsis symptoms. **Results:** Reported neonatal sepsis symptoms occurred in 21.7% of newborns. Once-daily CHX application (OR = 0.2, $p < 0.001$) and hand hygiene (OR = 0.3, $p = 0.01$) were associated with reduced odds of symptoms. CHX application for less than seven days was associated with increased odds (OR = 2.3, $p = 0.006$), while awareness alone showed no protective association. Shorter application duration remained associated with symptoms after adjustment (AOR = 4.05, $p = 0.022$). **Conclusion:** Appropriate CHX cord care practices were associated with fewer reported neonatal sepsis symptoms. Practical maternal education, adherence support, and culturally responsive community interventions may improve newborn cord care.*

Keywords: Chlorhexidine, Umbilical Cord Care, Maternal Awareness, Cultural Practices, Neonatal Sepsis, Kenya

1. Introduction

Neonatal sepsis remains a leading contributor to newborn morbidity and mortality, particularly in low- and middle-income countries. Globally, an estimated 2.3 million neonatal deaths occurred in 2022, nearly half of all deaths among children younger than five years. Prematurity, birth asphyxia, and neonatal infections, particularly sepsis, remain major causes, with sub-Saharan Africa recording the highest neonatal mortality rate globally. [1,2]

Umbilical cord care is central to neonatal sepsis prevention because the freshly cut stump can serve as a portal of entry for pathogenic organisms. Poor hygiene and application of contaminated substances may cause omphalitis and systemic infection. [3,4] Chlorhexidine gluconate (CHX) 7.1%, delivering 4% chlorhexidine, is recommended in high-risk settings because it reduces cord infections and, in some settings, neonatal mortality. [5,6] WHO and national policies support CHX use where infection risk and hygienic conditions warrant it. [7,8]

Kenya continues to experience a substantial neonatal mortality burden. The 2022 Kenya Demographic and Health Survey reported neonatal mortality of 21 deaths per 1,000 live births, with neonatal sepsis remaining an important contributor to newborn morbidity and mortality. [9,10] The Ministry of Health incorporated CHX 7.1% cord care into newborn-care programming; however, effective implementation depends on availability, understanding, acceptability, correct application and adherence. [8]

Vihiga County continues to report neonatal sepsis despite CHX implementation. Traditional practices, including use of spirit, herbs, ash, salty water, sand and animal dung, may persist despite health education, reflecting household influences, community norms, and traditional birth attendants. [3,11,12] This persistence suggests a gap between CHX availability, knowledge, and actual practice. Local evidence linking maternal awareness, acceptability, cultural practices, and perceptions of CHX with neonatal sepsis symptoms remains limited. This study therefore assessed these factors among mothers in Vihiga County and examined their association with reported neonatal sepsis symptoms.

2. Methods

Study Design and Setting

We conducted an analytical cross-sectional study using a mixed-methods approach in Vihiga County to assess mothers' awareness, acceptability, cultural practices, and perceived effectiveness of chlorhexidine (CHX) cord care and their association with the clinical presentation of neonatal sepsis.

Vihiga County, located in western Kenya, comprises five sub-counties and has an estimated population of 622,543 (KPHS, 2024). The county records approximately 19,240 births annually, with 70% conducted by skilled birth attendants. Its health system includes one county referral hospital, two sub-county hospitals, four mission hospitals, 18 health centres, 27 dispensaries, and 40 private clinics. The population is predominantly from four Luhya sub-tribes: Maragoli, Tiriki, Banyore, and Terik. CHX 7.1% cord care was introduced in county facilities in 2015 following healthcare worker sensitization and continuous professional education.

The county operates a community health strategy through approximately 145 functional community units supported by Community Health Promoters (CHPs) and Community Health Assistants (CHAs). Despite these interventions, traditional cord-care practices, including use of herbs, ash, and cow dung, persist in some communities.

Study Population

The study targeted mothers residing in Vihiga County who had delivered within one year preceding the study, irrespective of whether the birth occurred at home or in a health facility. Mothers who experienced stillbirths or had documented mental illness were excluded from participation.

Sample Size and Sampling Procedure

A multistage cluster sampling technique was used to recruit study participants. Three sub-counties were randomly selected from the five sub-counties in Vihiga County using ballot sampling. In the first stage, three locations were randomly selected from each selected sub-county. In the second stage, four villages within the catchment areas of selected health facilities distributing CHX were randomly sampled to form clusters.

Households with eligible mothers were identified with the assistance of CHPs, village headmen, and CHEWs using community household registers. A sampling frame of eligible mothers was developed from the identified households, after which simple random sampling was applied to select study participants.

The sample size was determined using the modified EPI cluster survey formula, incorporating a 95% confidence level, an error margin of 5%, estimated prevalence of neonatal sepsis, and adjustment for cluster sampling design effect. A total sample of 378 mothers was obtained for the quantitative survey. In addition, three key informants drawn from sub-county hospitals participated in qualitative interviews.

Data Collection

Data were collected using interviewer-administered structured questionnaires and key informant interview guides.

The tool captured socio-demographic characteristics, awareness and acceptability of CHX cord care, cultural cord care practices, perceived effectiveness of CHX, and neonatal sepsis-related outcomes.

Qualitative data were collected through face-to-face key informant interviews using semi-structured interview guides developed in line with the study objectives. Interviews were conducted interactively using probes to clarify responses and explore emerging issues in greater depth. Field notes were taken during interviews.

Training and Pretesting

Research assistants were trained on study procedures, interviewing techniques, ethical considerations, CHX cord care practices, and recognition of clinical features of neonatal sepsis. One research assistant received additional training on data entry and quality control procedures.

Study instruments were pretested in Sabatia Sub-County, an area not included in the main study. The questionnaire was piloted among 40 mothers, representing approximately 10% of the calculated sample size, while the qualitative interview guide was piloted among two purposively selected respondents. Feedback from the pretest informed refinement of question wording, sequencing, and clarity.

Validity and Reliability

Content and construct validity of the questionnaire were ensured through expert review by experienced maternal and child health nurses. The questionnaire was structured according to the study objectives and conceptual framework to ensure adequate representation of all study variables. Necessary revisions were made based on expert recommendations.

Reliability of the questionnaire was assessed during the pilot study using Cronbach's alpha coefficient to evaluate internal consistency of Likert-scale items. A Cronbach's alpha coefficient of 0.7 was obtained, indicating acceptable reliability of the study instrument.

Data Analysis

Quantitative data were coded, cleaned, and entered into Statistical Package for Social Sciences (SPSS) version 30.0 for analysis. Descriptive statistics including frequencies, percentages, means, medians, standard deviations, and ranges were used to summarize study variables. Likert-scale responses were collapsed into dichotomous categories, where scores of 4 and 5 represented agreement, while scores of 1 to 3 represented disagreement. Associations between independent variables and clinical presentation of neonatal sepsis were assessed using logistic regression analysis. Odds ratios (ORs) and 95% confidence intervals (CIs) were computed to estimate the strength of associations. Variables with p -values ≤ 0.1 in bivariate analysis were included in the multivariable logistic regression model to control for potential confounding factors. Statistical significance was set at $p < 0.05$.

Qualitative data from key informant interviews (KIIs) were analyzed thematically through identification and organization

of emerging themes related to awareness, cultural practices, and utilization of CHX cord care.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Review Committee and the National Commission for Science, Technology and Innovation (NACOSTI), with additional authorization from relevant county and sub-county health authorities.

Written informed consent was obtained from all participants before data collection. For participants younger than 18 years, parental/guardian consent and participant assent were obtained. Participation was voluntary, with the right to withdraw at any stage without penalty. Confidentiality and anonymity were ensured through unique participant codes rather than names. Study records were securely stored and access restricted to authorized research team members.

3. Results

Socio-Demographic Characteristics of the Study Participants.

Of the 378 mothers targeted, 345 completed the interviews, yielding a response rate of 91.3%. Respondents had a mean age of 26.9 ± 6.1 years (range: 14-46 years), with most aged 20-29 years (61.5%). Nearly half had attained secondary education (47.5%), while 22.9% had tertiary education. Most respondents were Catholic (78.6%), self-employed (27.5%), and from Hamisi Sub-county (47.5%). The predominant ethnic groups were Maragoli (39.1%) and Tiriki (35.4%).

Table 1: Socio-Demographic Characteristics of the Study Participants.

Variable	Response	N	%
Mothers' age group in years	10 – 19	30	8.7
	20 – 29	212	61.5
	30 – 39	87	25.2
	≥ 40	16	4.6
Mothers Mean age $\pm$ SD (Range) in years		26.9 ± 6.1 (14.0 – 46.0)	

Level of education	No education	6	1.7
	Primary	96	27.8
	Secondary	164	47.5
	College/University	79	22.9
Religion	Catholic	271	78.6
	Protestant	58	16.8
	Muslim	14	4.1
	Others	2	0.6
Occupation	Not employed	34	9.9
	Housewife	69	20.0
	Farmer	56	16.2
	Business	95	27.5
	Employee	61	17.7
	Student	30	8.7
Name of sub-county	Sabatia	105	30.4
	Hamisi	164	47.5
	Emuhaya	76	22.1
Sub-Tribe	Bunyore	71	20.6
	Tiriki	122	35.4
	Maragoli	135	39.1
	Butsotso	17	4.9

Socio-demographic factors influencing the clinical presentation of neonatal sepsis

Table 2 presents the bivariate analysis of socio-demographic factors associated with neonatal sepsis among study participants. Maternal employment status was significantly associated with neonatal sepsis, while maternal age and sub-tribe showed borderline associations. Babies of unemployed or housewife mothers had 80% lower odds of presenting with clinical signs and symptoms suggestive of neonatal sepsis than those of employed mothers (OR: 0.2; 95% CI: 0.1–0.4; $p < 0.0001$). Babies of mothers younger than 30 years had lower odds of presenting with neonatal sepsis signs and symptoms, although this association was not statistically significant (OR: 0.7; 95% CI: 1.0–3.2; $p = 0.07$). Babies of mothers from the Tiriki sub-tribe also had lower odds of presenting with neonatal sepsis signs and symptoms, with the association not reaching statistical significance (OR: 0.6; 95% CI: 0.3–1.1; $p = 0.07$).

Table 2: Socio-demographic factors influencing the clinical presentation of neonatal sepsis

Independent variable	Categories	N	Neonatal sepsis signs & symptoms		OR	95% CI	P value
			Yes	No			
Age group in years	< 30	242	24.4	75.6	0.7	1.0 – 3.2	0.07
	≥ 30	103	15.5	84.5			
Level of education	None / Primary	102	15.7	84.3	0.6	0.3 – 1.1	0.08
	Secondary / Tertiary	243	24.3	75.7			
Religion	Catholic	271	20.3	79.7	0.7	0.4 – 1.2	0.2
	Protestant / Muslims	74	27.0	73.0			
Occupation	None / Housewife	103	5.8	94.2	0.2	0.1 – 0.4	< 0.0001
	Self-employed / Employed	242	28.5	71.5			
Sub-Tribe	Tiriki	122	16.4	83.6	0.6	0.3 – 1.1	0.07
	Maragoli, Bunyore, Butsotso, Others	223	24.7	75.3			
	Maragoli	135	25.2	74.8	1.4	0.8 – 2.3	0.2
	Tiriki, Bunyore, Butsotso, Others	210	19.5	80.5			

Awareness of Chlorhexidine (CHX) Cord Care

Nearly all respondents attended antenatal care (98.8%). Among them, 82.7% received CHX during antenatal visits, while 85.6% received information on its use. Healthcare

workers were the primary information source (72.1%), followed by community health volunteers (26.9%). Most mothers received comprehensive instructions on application method, frequency, site, and possible side effects (93.6%).

Table 3: Maternal Awareness of CHX Cord Care

Variable	Response	N	%
Where attended ANC	Hospital	341	98.8
	Did not attend	4	1.2
Given CHX tube at the clinic	Yes	282	82.7
	*No	59	17.3
Was given information about CHX	Yes	292	85.6
	No	49	14.4
Kind of information provided	What it is	9	3.0
	How to use it	10	3.4
	Application, frequency, where to apply it and side effects	278	93.6
Who provided the information	Healthcare worker	214	72.1
	Pamphlets and posters	1	0.3
	Local media	2	0.7
	CHV	80	26.9

Association Between Awareness of CHX and Neonatal Sepsis

Bivariate analysis showed that mothers who had received CHX information were more likely to report neonatal sepsis

symptoms among their infants (OR = 3.0; 95% CI: 1.2–7.9; $p = 0.02$). Similarly, receiving information from healthcare workers was significantly associated with reported neonatal sepsis symptoms (OR = 3.0; 95% CI: 1.6–5.5; $p < 0.001$).

Table 4: Association Between Awareness of CHX and Neonatal Sepsis

Independent variable	Categories	N	Neonatal sepsis clinical signs & symptoms		OR	95% CI	P value
			Yes	No			
Given CHX tube at the clinic	Yes	282	20.6	79.4	0.7	0.4 – 1.3	0.3
	No	63	27.0	73.0			
Was given information about CHX	Yes	292	24.0	76.0	3.0	1.2 – 7.9	0.02
	No	53	9.4	90.6			
Kind of information provided	All information about CHX	278	23.0	77.0	1.5	0.7 – 3.1	0.2
	Selected information, how used, application, etc	67	16.4	83.6			
Who provided the information	Healthcare worker	215	27.9	72.1	3.0	1.6 – 5.5	0.0004
	CHV, media	130	11.5	88.5			

Acceptability and Practice of CHX Cord Care

Most mothers carried CHX to the health facility during delivery (80.5%) and applied it to the newborn cord after birth (87.8%). However, only 18.5% adhered to the recommended seven-day duration, while 72.6% used CHX for less than seven days. Application frequency varied, with 47.5%

applying it once daily and an equal proportion two to three times daily.

Most respondents applied CHX around the cord tip and base (41.8%), while 20.7% reported washing hands before application. Approximately 70.6% indicated that the cord dropped completely and dried normally following CHX use.

Table 5: Acceptability and Practice of CHX Cord Care

Variable	Response	N	%
Carried CHX when went for delivery	Yes	227	80.5
	#No	55	19.5
Applied CHX on baby's cord after delivery	Yes	303	87.8
	No	42	12.2
If, No, what was applied on the cord	Spirit	2	18.2
	Nothing	6	54.6
	Don't know	3	27.3
Duration CHX was applied on the cord	Less than 7 days	220	72.6
	7 days	56	18.5
	More than 7 days	27	8.9
Frequency of application of CHX on the cord	Once a day	144	47.5
	2 -3 times daily	144	47.5
	More than 3 times daily	15	4.9
How CHX was applied	Applied gently around the tip and base of the cord	125	41.8
	Washed hands and applied after bathing baby	62	20.7
	Use one finger to spread the umbilical and cut stump	56	18.7
	Washed my hands and applied around the cord	48	16.1
	Wipe cord and apply with finger	3	1.0
	Put on gloves and applied it around the cord	2	0.6
	The nurse applied it on baby's cord	2	0.7
	Applied spirit daily after washing baby	1	0.3

Status of cord after use	Dropped and completely dry	214	70.6
	Dropped but not dry	73	24.1
	Dry but did not drop	14	4.6
	Other	2	0.7
Duration it took for the cord to dry and drop	Less than 7 days	248	81.9
	7 days	28	9.2
	More than 7 days	27	8.9

Association Between CHX Practices and Neonatal Sepsis

Several CHX cord care practices were significantly associated with neonatal sepsis symptoms. Infants whose mothers applied CHX for less than seven days had higher odds of neonatal sepsis symptoms (OR = 2.3; 95% CI: 1.3–4.1; $p = 0.006$). Inappropriate application techniques were also associated with increased odds (OR = 5.6; 95% CI: 3.2–9.8; $p < 0.001$).

Conversely, once-daily CHX application significantly reduced the odds of neonatal sepsis (OR = 0.2; 95% CI: 0.1–0.4; $p < 0.001$). Hand hygiene before application was protective (OR = 0.3; 95% CI: 0.1–0.8; $p = 0.01$). Infants whose cords dried completely and detached normally had substantially lower odds of neonatal sepsis (OR = 0.1; 95% CI: 0.03–0.13; $p < 0.001$).

Table 6: Association Between CHX Practices and Neonatal Sepsis

Independent variable	Categories	N	Neonatal sepsis clinical signs & symptoms		OR	95% CI	P value
			Yes	No			
Carried along the CHX when going to deliver	Yes	227	23.3	76.7	1.3	0.8 – 2.3	0.3
	No	118	18.6	81.4			
Applied CHX on baby's cord after delivery	Yes	303	22.8	77.2	1.8	0.7 – 4.4	0.2
	No	42	14.3	85.7			
Duration CHX was applied on the cord	Less than 7 days	220	26.4	73.6	2.3	1.3 – 4.1	0.006
	≥ 7 days	125	13.6	86.4			
Frequency of application of CHX on the cord	Once daily	144	8.3	91.7	0.2	0.1 – 0.4	< 0.0001
	More than once daily	201	31.3	68.7			
How CHX was applied	Applied gently around the tip and base of the cord	125	40.8	59.2	5.6	3.2 – 9.8	< 0.0001
	Other methods	220	10.9	89.1			
How CHX was applied	Washed hands and applied after bathing baby	62	9.7	90.3	0.3	0.1 – 0.8	0.01
	Other methods	283	24.4	75.6			
Status of cord after use	Dropped and completely dry	214	5.6	94.4	0.1	0.03 – 0.13	< 0.0001
	Dropped but not dry or did not drop	131	48.1	51.9			
Duration it took for the cord to dry and drop	7 days	28	3.6	96.4	0.1	0.01 – 0.91	0.02
	Less than 7 or more than 7 days	317	23.3	76.7			

Cultural Cord Care Practices

Alternative cord care substances were reported by 10.3% of mothers, including methylated spirit (45.5%), Vaseline (24.2%), warm salty water (15.1%), and herbs (9.1%). Rare practices included applying sand and dung. Reasons included faster cord drying, infection prevention, and previous

successful experiences. Over half of mothers using alternative substances combined them with CHX.

Qualitative interviews revealed persistent traditional cord care practices, particularly during home deliveries attended by traditional birth attendants. Some newborns were bathed with herbal mixtures before CHX application.

Table 7: Cultural Practices Related to Cord Care

Variable	Response	N	%
Applied other substance(s) to the cord	Yes	33	10.3
	No	286	89.7
Type of substance used	Spirit	15	45.5
	Vaseline	8	24.2
	Warm salty water and spirit	5	15.1
	Herbs	3	9.1
	Lizard dung	1	3.0
	Sand	1	3.0
Reason why used	Kills germs and dries up cord	23	69.7
	Used them previously	8	24.2
	Was not given CHX	2	6.1
Applied other substances on cord	Yes	16	55.2
	No	13	44.8
Substances community prefer using for cord care	Don't know	116	33.6
	Cleaning	127	36.8
	Spirit, CHX, Vaseline mixture	34	9.9

Reason why preferred	Herbs, water and spirit mixture	25	7.2
	Dust, sand salty water, spirit mixture	19	5.5
	Ash, spirit, lizard dung, herbal medicine	12	3.5
	Salty water and spirit	10	2.9
	CHX	2	0.6
	Don't know	241	69.9
	Prevents infection to the cord	46	13.3
	Dries up the cord faster and falls off easily	32	9.3
	Is the trend	15	4.3
	Have no knowledge about CHX	11	3.2

Mothers who identified substances commonly preferred by the community for cord care had significantly higher odds of reporting neonatal sepsis symptoms among their newborns (OR = 3.7; 95% CI: 1.9–7.3; $p < 0.001$).

Table 8: Association Between Cultural Practices and Neonatal Sepsis

Independent variable	Categories	N	Neonatal sepsis signs & symptoms		OR	95% CI	P value
			Yes	No			
Applied other substance(s) to the cord	Yes	33	27.3	72.7	1.4	0.6 – 3.2	0.4
	No	312	21.2	78.8			
Other substances applied	Spirit, Vaseline, salty water, herbs, sand, lizard dung	33	21.2	78.8	1.0	0.4 – 2.3	0.9
	No	312	21.8	78.2			
Reason given	Kills germs, used previously, not given CHX	33	21.2	78.8	1.0	0.4 – 2.3	0.9
	No	312	21.8	78.2			
Substances community prefer using for cord care	Provided examples of preferred substances	229	27.9	72.1	3.7	1.9 – 7.3	< 0.0001
	Don't know	116	9.5	90.5			
Reasons for preference	Reason given	104	22.1	77.9	1.0	0.6 – 1.8	0.9
	Don't know	241	21.6	78.4			

Perceived Effectiveness and Side Effects of CHX

Most mothers perceived CHX as effective in preventing neonatal infections. Approximately 65.8% agreed that CHX could reduce neonatal morbidity and mortality, while 76.2% believed it reduced superficial infections. Nearly all respondents (96.5%) agreed that CHX reduces bacterial colonization of the umbilical cord.

Despite positive perceptions, 28.7% reported side effects, mainly cord discharge/oozing (47.1%) and periumbilical rashes (34.5%). Most mothers either discontinued CHX or took no action. Nevertheless, 93.1% would recommend CHX to other mothers, and 93.7% identified it as their preferred cord care method.

Predictors of Neonatal Sepsis

Multivariable logistic regression identified independent predictors of neonatal sepsis symptoms. Infants whose mothers applied CHX for less than seven days had fourfold higher odds of neonatal sepsis symptoms (AOR = 4.05; 95% CI: 1.23–13.37; $p = 0.022$). Perception that CHX reduces omphalitis was also associated with increased odds of neonatal sepsis (AOR = 5.66; 95% CI: 2.46–18.44; $p < 0.001$).

Protective factors included maternal unemployment/housewifery (AOR = 0.14; 95% CI: 0.04–0.50; $p = 0.003$), complete cord drying and detachment (AOR = 0.02; 95% CI: 0.01–0.06; $p < 0.001$), and normal cord separation at seven days (AOR = 0.03; 95% CI: 0.003–0.364; $p = 0.006$).

Table 9: Perceived Effectiveness and Side Effects of CHX

Statement	Response	N	%
Chlorhexidine-based antiseptic interventions have the potential for significant reduction of the burden of neonatal morbidity and mortality	Agree	227	65.8
	Disagree	118	34.2
Use of CHX cord care reduce the risk of omphalitis	Agree	221	64.1
	Disagree	124	35.9
Use of CHX cord care reduce superficial infections	Agree	263	76.2
	Disagree	82	23.8
Use of CHX cord care reduce bacterial colonization after chlorhexidine treatment of the cord	Agree	333	96.5
	Disagree	12	3.5
Full-body cleansing with CHX at birth offer an important protective benefit, especially for low-birth-weight	Agree	283	82.0
	Disagree	62	18.0

Table 11: Multivariable Logistic Regression Analysis of Predictors of Neonatal Sepsis

Independent variable	Responses	Estimate	AOR	95% CI	P value
Occupation	Not employed / Housewife vs Self or Employed	-1.9949	0.136	0.037– 0.498	0.0026
Duration CHX was applied on the cord	Less than 7 days vs ≥ 7 days	1.3988	4.050	1.227– 13.373	0.0217
Status of cord after use	Dropped and completely dry vs Dropped but not dry or did not drop	-4.0793	0.017	0.005– 0.058	< 0.0001
Duration it took for the cord to dry and drop	7 days vs Less than 7 or more than 7 days	-3.4359	0.032	0.003 – 0.364	0.0055
Chlorhexidine-based antiseptic interventions have the potential for significant reduction of the burden of neonatal morbidity and mortality	Agree vs Disagree	-2.2622	0.104	0.015 - 0.701	0.0201
Use of chlorhexidine cord care reduces the risk of omphalitis	Agree vs Disagree	1.4550	5.658	2.464 - 18.438	0.0001

4. Discussion

This study demonstrates an implementation gap between maternal awareness and adherence to recommended CHX practices. Despite high CHX information exposure (85.6%) and facility-based access (82.7%), only 18.5% of mothers reported using CHX for seven days, while 20.7% reported hand hygiene before application. Thus, CHX availability and knowledge do not necessarily translate into correct or sustained cord-care practices, highlighting the need for interventions emphasizing practical skills and behavioural reinforcement.

It is important to note that the relationship between CHX information and sepsis symptoms should not be taken to be causal. This is because the use of a cross-sectional study design, in addition to outcomes based on sepsis symptoms, allows for the phenomenon of reverse causality and recall bias. Mothers who had babies with sepsis symptoms may have been provided with further counseling during clinical sessions or have a different recall regarding the information provided to them.

Suitable cord care practices showed better consistency in their association with decreased presence of neonatal sepsis symptoms. Daily administration of CHX, good hand washing practices, and proper drying of the umbilical cord were protective in the bivariate analysis, while shorter CHX use maintained independent association with an increased likelihood even after multivariable analysis. These results suggest that the efficacy of cord antiseptic based on chlorhexidine is linked to appropriate practice, especially under higher risk conditions for infections. [5,6,13] However, shorter CHX use and neonatal sepsis symptoms require careful interpretation since it could also be due to different conditions of the neonates themselves.

Cultural and household influences also appear relevant to cord-care practices. Although only 10.3% of mothers reported personally using alternative substances, qualitative findings indicated that household and community norms may influence cord-care decisions. Spirit, herbs, salty water, sand and dung have similarly been documented in other low-resource settings. [3,11,12] These findings underscore the importance of behaviour-change interventions that explain normal cord drying and separation, demonstrate correct CHX application, address misconceptions and engage household and community actors influencing newborn-care practices.

Maternal perceptions of CHX were favourable, with more than nine in ten mothers willing to recommend CHX or identifying it as their preferred cord-care method. However, 28.7% reported perceived side effects, predominantly cord discharge/oozing and rashes. Such experiences may compromise adherence without guidance. Counselling should therefore distinguish expected local changes from danger signs and emphasize timely evaluation of newborns with concerning symptoms.

The protective associations observed for complete cord drying and normal separation should be interpreted cautiously. These characteristics may indicate normal cord healing rather than independent causal determinants of reduced neonatal sepsis symptoms. Similarly, the apparent protective association between maternal unemployment/housewife status and neonatal sepsis symptoms may reflect unmeasured socioeconomic, caregiving or household characteristics. These findings warrant further investigation rather than causal interpretation.

Several limitations should be considered. First, the cross-sectional design limits assessment of temporality and precludes causal inference between cord-care practices and neonatal sepsis symptoms. Second, the outcome was based on maternally reported clinical signs and symptoms rather than laboratory-confirmed neonatal sepsis. Consequently, findings represent associations with reported symptoms suggestive of neonatal sepsis, not estimates of confirmed neonatal sepsis incidence.

5. Conclusion

Maternal awareness and access to chlorhexidine cord care were high in Vihiga County, but adherence to recommended practices remained inadequate. Shorter CHX application duration was independently associated with increased odds of reported neonatal sepsis symptoms, while complete cord drying and normal separation were associated with reduced odds. Traditional cord care practices and inconsistent hand hygiene also highlighted important implementation challenges. Strengthening practical maternal education, early postnatal follow-up, and culturally responsive community engagement may improve CHX utilization and newborn cord care. Further prospective research is needed to establish whether improved adherence reduces clinically confirmed neonatal infections.

6. Recommendations

First, health facilities should standardize CHX counselling through brief practical demonstrations covering hand hygiene, correct application, frequency, and the correct duration of use. Second, CHPs and other community health workers should conduct early postnatal follow-up to reinforce correct practices and identify newborn danger signs. Third, community interventions should engage fathers, grandmothers, traditional birth attendants, and other household influencers who may shape cord-care decisions. Fourth, counselling should clarify expectations regarding normal cord drying and separation, and risks associated with unapproved substances. Finally, prospective and intervention studies should assess whether intensified community follow-up improves adherence and reduces the clinically confirmed neonatal infections.

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