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ORIGINAL RESEARCH

Determinants of materials used for home cord care among mothers attending the immunization clinic at the State Specialist Hospital, Akure, Ondo State, Southwest, Nigeria

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Abstract

Background: Using inappropriate materials for umbilical cord care may predispose newborns to infection.

Objectives: To determine the materials mothers use for their babies' umbilical cord care and identify the factors that influence their choices.

Method: We conducted a cross-sectional study at the immunization clinic, recruiting consecutive mothers of infants aged 0-28 days who presented for immunization to assess their umbilical cord care practices. Cord care with chlorhexidine gel alone was considered good cord care. We analyzed the data using SPSS version 20. We considered p-values < 0.05 statistically significant.

Results: Two hundred and two (94.8%) of the 213 women studied received antenatal care, and 176 (82.6%) received information about cord care from the health care worker. Materials used to tie the cord included plastic cord clamps

in 187 (87.8%) babies, and 90 (42.3%) applied only chlorhexidine gel to care for the umbilical cord. Other cord care methods included methylated spirit, hot compresses, shea butter, and Mentholatum.

Factors significantly associated with good cord care included antenatal care attendance ($p = 0.02$), receiving cord-care information from a health care worker ($p < 0.001$), and having a skilled birth attendant at delivery ($p = 0.034$). Baby sex, parity, education level, social class, and mother's age were not significantly associated with good cord care practices.

Conclusions: Antenatal care and delivery in the health facility enabled mothers to receive information on standard umbilical cord care.

Keywords: ***Antenatal care, Chlorhexidine gel, Determinants, Immunization clinic, Birth attendant, Umbilical cord care***

Introduction

Cord care is the series of steps involved in handling of the umbilical cord of the newborn after delivery. [1] Neonatal infection is still a common problem in Nigeria and can lead to significant morbidity and mortality in the newborn. [2,3] The umbilical cord area supports growth of some innocuous or beneficial microorganisms (commensals) whereas others are harmful. [4] Accidental contamination of the moist umbilicus, or treatment with inappropriate substances are the usual source of infection. Poor umbilical cord care is a risk factor for the development of omphalitis, neonatal sepsis or neonatal tetanus, a highly fatal infection in Nigeria. Annually about 4 million neonatal deaths occur around the world, of these, more than 30% are caused by infections[5] some of which start as umbilical cord infection.[6]

The efforts to reduce under-five mortality will remain a mirage if neonatal infections are not prevented and treated adequately when they occur. Therefore, appropriate cord care will help reduce mortality and morbidity associated with umbilical cord infection.

Mothers in Nigeria still apply various substances to the newborn's umbilical cord. Many of these substances are not beneficial, and some are harmful. The World Health Organization (WHO) recommends umbilical cord care without applying any substance. However, in developing countries and in settings with poor hygiene, WHO recommends using chlorhexidine, an antiseptic, to reduce bacterial colonization and infection. [4,7]

This study aims to determine the materials mothers use to care for their babies' umbilical cords at home and to identify the factors that influence their choices. The study hopes that the knowledge gained will guide health workers in better educating pregnant mothers and caregivers on appropriate home cord care, help the hospital formulate cord care

guidelines, and assist the Government in formulating policies that promote appropriate cord care.

Methods

This cross-sectional, descriptive study was conducted at the Immunization Clinic of the former State Specialist Hospital, Akure, Ondo State, which was renamed twice: first as the University of Medical Sciences Teaching Hospital (UNIMEDTH) Complex, Akure, and now as the FUTA Teaching Hospital (FutaTH), Akure. The hospital is a major public medical center located in Ondo State. It provides general healthcare, emergency medical services, maternity care, and specialist treatments for residents of Akure (Ondo State), nearby communities, and neighboring Ekiti, Osun, Edo, and Ogun states.

Mothers of babies aged 0-28 days brought for routine immunization at the study location were recruited over a period of six weeks (February 4 to March 16, 2019). During this period, the mothers were still actively caring for their babies' umbilical stumps and provided verbal and written informed consent. Mothers whose babies had omphalocele or other related congenital abnormalities, and those who required hospital admission at birth, were excluded. Appropriate cord care involves bathing the baby and either leaving the cord exposed to dry or applying chlorhexidine to the cord. Any deviation from this documented practice is considered poor or inappropriate cord care.

We collected data using a purpose-designed, pretested questionnaire. We pretested the questionnaire at the immunization clinic of the Mother and Child Hospital in Akure over two weeks among mothers of babies aged 0-28 days. Medical students and medical doctors (briefed and trained on the study's purpose and objectives) administered the questionnaires and interpreted the questions in a language the mothers clearly understood. The questionnaire included questions on the parents' socio-demographic characteristics, antenatal care (ANC) history, place and mode of delivery, type of umbilical cord care, use of chlorhexidine gel, and other relevant history. The study also recorded mothers' parity and their sources of information about umbilical cord care. Oyedeji described the mothers' socioeconomic classes as derived from their educational attainment and parents' occupations.[8] Mothers who did not receive ANC or deliver in a government or private hospital were regarded as not having had ANC or delivery supervised by a trained birth attendant. In this study, cord care with

chlorhexidine gel was considered good cord care. We considered the use of other preparations, such as methylated spirit, mentholatum, hot fomentation, or shea butter, as poor cord care.

Data were entered manually into the computer and analyzed using SPSS version 20. We analyzed the association between the outcome variable (cord care practice) and the independent variables (mother's age, parity, level of education, social class, baby's sex, sources of information on cord care, ANC attendance, and presence of a skilled birth attendant at delivery) using Chi-square. We considered $p < 0.05$ statistically significant. Results were presented in prose, tables, and figures as necessary.

Ethical Considerations: The Ondo State Ministry of Health approved this study (OSHREC01/07/2024/713). The mothers provided informed consent.

Results

Two hundred and thirteen (213) mothers of infants aged 0 to 28 days completed the questionnaire. Table I shows their ages, educational attainment, and socioeconomic status.Of the 213 mothers, 166 (77.9%) received antenatal care at government specialist hospitals or the Mother and Child Hospital (MCH), while 2 (0.9%) did not attend any ANC. One hundred and forty-eight (68.6%) babies were delivered at the State Specialist Hospital or MCH, and one was delivered in a car en route to the hospital. Table II provides additional details on the place of antenatal care and delivery.

Table I: Mothers' Sociodemographic Characteristics

Characteristics		**n (%)**
Age (years)	< 20	2 (0.9)
	20 - 29	64 (30)
	30 - 39	138 (64.8)
	≥ 40	9 (4.3)
Range 18-43	Mean (SD) 31.66 (5.00)	
Parity	*Primipara	63 (29.6)
	**Multipara	143 (67.1)
	***Grandmultipara	7 (3.3)
Educational attainment	Primary	7(3.3)
	Secondary	73 (34.3)
	Tertiary	133 (62.4)
Social Class	Class I	23 (10.8)
	Class II	100 (46.9)
	Class III	80 (37 .6)
	Class IV	10 (4.7)

***Primipara = women giving birth for the first time to a viable offspring**

****Multipara = women who have given birth two or more times to viable offspring**

*****Grandmultipara = women who have given birth to viable offspring five or more times**

Table II: Place of antenatal care and delivery

Place of Antenatal care	**n**	**%**
Government specialist hospitals or MCH	166	77.9
Private hospitals	21	10
Government-owned maternities & health centers	15	7
Mission houses/ delivery homes	9	4.2
No ANC	2	0.9
ANC Attendance		
Yes	202	94.8
No	11	5.2
Place of Delivery		
Government specialist hospitals/ MCH	146	68.6
Private hospitals	28	13.1
Mission houses/ delivery homes	19	8.9
Government maternities / health centers	11	5.2
At home/ in the car	9	4.2

Table III presents the general characteristics of the babies, including gender, gestational age, age at presentation, birth weight, and mode of delivery. Table IV shows the sources of the mothers' information about umbilical cord care. Most mothers (82.6%) received cord care information from health workers. Table IV shows the details.

Of the 213 respondents, 170 (79.8%) knew about chlorhexidine gel, while 43 (20.2%) did not. Of the 170 mothers who knew about chlorhexidine gel, 167 (98.2%) got their information from a health worker, while the other three got it from a friend, a neighbor, and a relative.

The materials used to tie the cord at birth were plastic cord clamps in 187 babies (87.8%), thread in 25 (11.7%), and bandage in one baby (0.5%).

Table III: General characteristics of the babies at delivery

Characteristics	N (number of babies)	Percentage (%) of babies)
Sex		
Male	113	53.1
Female	100	46.9
Maturity		
Term	205	96.2
Preterm	8	3.8
Birth Weight in kilogram		
<2.5	20	9.4
2.5 - <4.0	177	83.1
≥4.0	16	7.5
Age in days		
0-7	125	58.7
8-14	54	25.4
15-21	28	13.1
22-28	6	2.8
Mode of Delivery		
Vaginal	167	78.4
Cesarean section	46	21.6

Table IV: The source of the mother's information on cord care

Source of mother's information on cord care	n (%)
Health care worker	176 (82.6)
Unknown sources	17 (8.0)
Mother's mother	7 (3.3)
Mission homes	6 (2.8)
Mother-in-law	4 (1.8)
Neighbour	1 (0.5)
Co-worker	1 (0.5)
Friends	1 (0.5)

Overall, 90 (42.3%) mothers used only chlorhexidine gel (the appropriate method), while 123 (57.7%) used other methods (poor or inappropriate). Comparing the frequencies of these two methods showed a statistically significant difference ($Z = 2.221$, $p = 0.026$). Table V shows the frequency of the different umbilical cord care practices.

Factors Associated with Cord Care Practice

Among the factors assessed that might influence the choice of baby cord care practice, attendance at the antenatal clinic, source of information, and who attended the mother at delivery showed significant differences when comparing the frequency of good cord care with that of poor care, as shown in Table VI.

Table V: The methods of umbilical cord care employed by mothers at home

Method of umbilical cord care	Sex of Child		Total N (%)
	Male	Female	
Chlorhexidine gel only	47	43	90 (42.3%)
Methylated spirit only	45	38	83 (39.0%)
Methylated spirit & hot compress	8	6	14 (6.6%)
Methylated spirit & chlorhexidine gel	7	7	14 (6.6%)
Hot compress, shea butter & chlorhexidine gel	2	4	6 (2.6%)
Mentholatum, methylated spirit & shea butter	2	2	4 (1.9%)
Mentholatum	1	0	1 (0.5%)
Shea butter	1	0	1 (0.5%)

Antenatal attendance, source of information, and who attended the patient at delivery significantly affected cord care practices among mothers (p=0.05); these factors positively affected cord care, as shown in Table VI.

Discussion

This study assessed home cord care practices among mothers of babies aged 0 to 28 days to determine the factors affecting these practices. Several substances were applied to newborns' umbilical cords with the intention of caring for them. Many of these practices are not beneficial, and some are outright harmful because they may promote infection and even cause physical injuries. All 213 women in this study applied some form of care, substance, or other intervention to their babies' umbilical cords.

It is worrisome that despite high levels of formal education among mothers and the high number who received cord care information from health workers, fewer than half (42.3%) practiced standard cord care. Nevertheless, this proportion is higher than the averages of 21.4% and 17% reported by Abegunde et al. from Bauchi and Sokoto respectively, in 2015 after three years of health education and mobilization. [9]

Table VI: Factors Associated with Cord Care Practice

Variables	Good Cord Care	Poor cord care	N	x^2	P
Parity					
Primipara	26(41.3%)	37(58.7%)	63(100%)	2.459	0.292
Multipara	63(44.1%)	80(55.9%)	143(100%)		
Grandmultipara	1(14.3%)	6(85.7%)	7(100%)		
Age					
<20	0(0%)	2(100%)	2(100%)	1.495	0.683
20-29	27(42.2%)	37(57.8%)	64(100%)		
30-39	59(42.8%)	79(57.2%)	138(100%)		
≥40	4(44.4%)	5(55.6%)	9(100%)		
Mother's Education					
Primary	42(43.3%)	55(56.7%)	97(100%)	0.086	0.958
Secondary	3(42.9%)	4(57.1%)	7(100%)		
Tertiary	45(41.3%)	64(58.7%)	109(100%)		
Social Class					
I	21(90.3%)	2(9.7%)	23(100%)	1.807	0.614
II	90(90.0%)	10(10.0%)	100(100%)		
III	68(85.0%)	12(15.0%)	80(100%)		
IV	8(80.0%)	2(20.0%)	10(100%)		
ANC Attendance					
Yes	89(44.1%)	113(55.9%)	202(100%)	4.228	0.02
No	1 (9.1%)	10 (90.9%)	11(100%)		
Source of Information					
Health Workers	89(50.6%)	87(49.4%)	176(100%)	28.707	<0.001
Non-Health Worker	1(2.7%)	36(97.3%)	3(100%)		
The supervising personnel at Delivery					
Skilled	83(45.1)	101(54.9%)	184(100%)	4.515	0.034
Not Skilled	7(24.1%)	22(75.9%)	29(100%)		
Babies' Sex					
Male	47(41.8%)	66(58.4%)	113(100%)	5.831	0.442
Female	43(43.0%)	57(57.0%)	100(100%)		

In 2016, Nigeria's Federal Ministry of Health acknowledged that uptake of this cost-effective, life-saving intervention had been slow. [10] At that time, uptake was estimated to be well below 5%. The national objective was to achieve 52% chlorhexidine uptake by 2020 through the development of the National Strategy and Implementation Plan for the scale-up of chlorhexidine in Nigeria. [10] The

World Health Organization (WHO) recommends chlorhexidine gel for cord care in areas where the neonatal mortality rate (NMR) exceeds 30 per 1000 live births. The current NMR of 37 per 1000 live births clearly places Nigeria in this category. Compared with the national average for chlorhexidine use and future projections, appropriate umbilical cord care in the study area appears to be on track.

The observed improvement in chlorhexidine use in the study area may be linked to mothers' education levels. All mothers in the study had formal education, with about half having tertiary education. By contrast, women in Bauchi and Sokoto were largely illiterate, with 75% and 80%, respectively, having no formal education.[9] Some women in the present study also applied several other harmful substances to their babies' cords. Several other studies have reported this. [11-13] Opara reported similar findings on poor cord care methods among a large proportion (62.4%) of the 221 women in Port Harcourt. [14] The Nigerian National Demographic Survey (NDHS 2018) reported that several inappropriate materials were used to care for the newborn's umbilical cord. [15] Other materials reported in the NDHS 2018, though not identified in the present study, included toothpaste, ash, powder, olive oil, turmeric, and animal dung. The study also found that applying non-antiseptic substances to the umbilical stump during cord care is more likely to cause fever than applying nothing. The 2023/24 NDHS did not include a report on cord care.[16]

It is also worth noting that none of the mothers in the present study applied cow dung to their babies' umbilical cords. Using cow dung may cause umbilical cord infection with Clostridium tetani, the causative organism of highly fatal tetanus. [17-19] It has been reported that infection is a major cause of neonatal deaths in developing countries, including Nigeria. [7] It is important for mothers to care for newborns' umbilical cords properly and to avoid substances that may increase the risk of infection.

About 80% of the 213 respondents were familiar with chlorhexidine. The majority of these respondents obtained their information from a health care worker. This apparently high percentage (80%) is still unacceptable, given the gel's significant advantages, especially in a country where many newborns are lost to infection each year. A study by Sinha et al. [20] evaluating the efficacy of neonatal skin or cord care with chlorhexidine found high-quality evidence that, in community settings, chlorhexidine skin or cord care reduces the incidence of omphalitis by

50% and neonatal mortality by 12%. A similar study by Sankar et al. [21] concluded that chlorhexidine application to the cord reduces the risk of neonatal mortality and omphalitis in infants born at home in high NMR settings. Chlorhexidine gel for newborn umbilical cord care was deemed essential and included in the WHO Model List of Essential Medicines for Children. [22]

In October 2013, WHO issued new guidelines for umbilical cord care, recommending daily application of 7.1% chlorhexidine digluconate to the umbilical cord stump during the first week of life in areas with high neonatal mortality.[22] In these settings, chlorhexidine should replace harmful traditional substances, such as cow dung, applied to the cord stump. It is also important to reinforce key newborn care messages among caregivers and providers. Chlorhexidine has no toxicity risks and virtually no potential for misuse. It has a long shelf life, requires no cold chain, and is extremely easy to apply with minimal training and no equipment. These factors make it suitable for hospital, health center, and home care alike. It is desirable that more publicity be given to chlorhexidine gel to reduce the present unacceptably high rate of neonatal mortality. According to USAID,[23] when applied to a newborn's umbilical cord in high-risk settings, chlorhexidine has been shown to reduce severe infection by 68 percent and mortality by 23 percent, potentially saving over 300,000 lives globally each year. The World Health Organization (WHO) recommends making it available and widely used. The Nigerian Federal Ministry of Health has implemented a scale-up strategy to ensure that this commodity becomes rapidly available and is used nationwide as part of essential newborn care shortly after birth.[10] Reinforce community messages on clean, dry cord care and, as appropriate, the addition of chlorhexidine.

Although the Nigerian Federal Ministry of Health [24] has adopted the WHO guidelines on chlorhexidine gel use, it still has five domains: market and user; manufacturing and distribution; clinical and regulatory; policy, advocacy, and financing; and coordination strategies. Implementation plans have also been put in place to achieve these strategies. [10]

The source of information on caring for newborns' umbilical cords is an important determinant of good cord-care practices. In this study, 82.6% of the 213 women received cord-care information from a health care worker (HCW). This proportion is higher than the 39.6% reported by Adebami [25] among 331 mothers in Ilesa, South-West Nigeria, and the 44.8% reported by Opara et al. [14] in Port Harcourt, South-South Nigeria. In the present

study, significantly more women who received information from an HCW (50.6%) practiced good cord care than those who obtained information from non-HCWs (2.7%) (p=0.001). This finding is consistent with reports from other studies. [14, 25] The findings further indicate that access to health information is essential to eliminating the harmful traditional practices currently being reported. Older women, primarily grandmothers, were also significant sources of information for mothers. These individuals should also receive accurate information through community gatherings and print and electronic media.

Other factors significantly associated with good cord care in the present study were ANC attendance during pregnancy and place of delivery. Parity, maternal age, maternal education level, and social class did not significantly affect cord care practices in this study. A similar finding by Abhulimhem and Ibadin [26] in Benin City shows that mothers who deliver outside orthodox health facilities are less likely to benefit from improved ANC and, to that extent, are more likely to engage in non-beneficial practices. The Benin City study [26] also reported that maternal age, maternal educational status, and infant gender influence cord care practices, which contrasts with the present study's findings. Although several studies have reported that socioeconomic status affects cord care, this study did not observe this association, likely because most mothers were from upper- and middle-class social groups. [9. 11-13] This is unsurprising, given that the study was conducted in the state capital, an urban community.

While several studies [9, 11-13] had reported that educated mothers were more likely to practice better cord care, the present study was a contrast, as many mothers with secondary and tertiary levels of education had 58.6% poor practice vs 41.4% good practice (although the difference is not statistically significant (Z = 1.826, p = 0.067), it speaks volumes). Thus, education has not penetrated their traditional and social beliefs about newborn care.

Limitation: This hospital-based study was conducted in an immunization clinic and did not include a community-based component, so its findings may not represent the entire state. Because the study was cross-sectional, it can establish associations but not causation.

Conclusions

Of the 213 respondents, only 42.3% practiced appropriate cord care, despite 79.8% knowing about chlorhexidine and 82.6% being educated. Among the factors assessed that might

influence the choice of baby cord care practice, attendance at the antenatal clinic, source of information, and who attended the mother at delivery showed significant differences in the frequency of good cord care. More resources may be deployed to ensure more women attend ANC and have skilled birth attendance at delivery. Public enlightenment programs should disseminate specific information on appropriate umbilical cord care and the importance of attending the antenatal clinic.

Recommendations: It is recommended that stakeholders in newborn care disseminate appropriate information about newborn care, especially cord care, to the public, particularly to women of reproductive age, husbands, grandmothers, and all health facility staff, via electronic media, leaflets, posters, and clinical, town hall, religious, and social meetings. The study also recommends training and retraining for obstetrics department staff, mission staff, and traditional birth attendants. These efforts will help promote good cord care in the study area and in Nigeria at large.

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Authors' contributions: OAO conceived the study and participated in the design, acquisition, interpretation, and analysis of the data, and in drafting and critically reviewing the manuscript for key intellectual content. BOI participated in the design of the work, interpretation of the data, and in drafting and critically reviewing the draft for important intellectual content. MAA participated in the design of the work, interpretation of the data, and critical review of the draft for important intellectual content. OOS participated in data acquisition, data interpretation, and critical review of the draft for important intellectual content. SOO participated in the design of the work, interpretation and analysis of the data, and critical review for important intellectual content. All the authors read and approved the final version for publication and agree to be accountable for all aspects of the work.

Conflicts of Interest: None to declare

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