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Survey of Umbilical Cord care and Separation time in Healthy Newborns in Kano

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Abstract Background: The interval between delivery and umbilical cord separation varies worldwide. Some maternal, foetal and perinatal factors including cord care practices are known to affect this interval.

Objectives: To establish the mean umbilical cord separation time and the effect of maternal and infant characteristics, perinatal factors and cord care practices on this time among healthy babies in northern Nigeria.

Methods: An interviewer questionnaire was administered on mothers of healthy babies at Child Welfare Clinics of a tertiary and secondary level hospital in Kano. In each case, information was obtained about mother's parity, place of antenatal care and delivery, gestational age, birth weight, time of umbilical cord separation after birth and cord treatment practices.

Results: Five hundred and seventy seven (96.2 percent) of 600 mothers interviewed, took part in the study, four of these mothers had twin gestation. Responses showed that cord separation time ranged from 2-14 days (4.20 1.70) Three

hundred and forty nine (60.9 percent) mothers applied methylated spirit, 145 (25.3 percent) used hot compress, while 50 (8.7 percent) applied toothpaste on the cord. Twenty (3.5 percent) others applied herbs, while nine (1.6 percent) applied dusting powder to the umbilical stump. Cord separation time was significantly shorter among babies whose mothers were of high parity, unbooked, and of low educational status. In addition, the use of razor blade, thread, hot compress or application of herbal preparations or toothpaste significantly shortened the separation time ($P<0.05$).

Conclusions: Cord separation time and cord care practices varied. Nigerian mothers often use unorthodox interventions to shorten cord separation time; however, the risk of omphalitis that may result from this is real. We recommend that each centre should adopt and teach mothers a standard hygienic cord care practice while discouraging the use of herbs and untested materials.

Keywords: Umbilical cord, Separation time, Cord care, Kano

Introduction

EACH year, approximately one million newborns worldwide die of infection caused by bacteria that enter the body via the umbilical cord.¹ When the cord is cut, the stump is suddenly deprived of its blood supply. The stump soon dries and turns black and

stiff (dry gangrene). The devitalized tissue of the cord stump can be an excellent medium for bacterial growth, especially if the stump is kept moist and unclean substances are applied to it.^{2,3} Adequate care of the umbilical cord stump of the newborn infant may prevent infections. At present, various topical methods are used for cord care, including washing

with soap and water, cleaning of the stump with alcohol, application of dry heat, use of dusting powder or antimicrobial creams. Powders currently used contain varying amounts of zinc oxide, talc, starch or alum, and other ingredients. Some powders also contain hexachlorophane or chlorhexidine.⁴ Common antimicrobial agents applied, include triple dye, tincture of iodine, iodophors, antibiotic ointments, silver sulfadiazine, povidone-iodine and chlorhexidine.⁴

The normal process of cord separation is by inflammation of its junction with the abdominal skin, resulting in collection of small amounts of cloudy mucoid material at the junction. This is often misinterpreted as pus.^{2,3} Variable times for cord separation have been reported, with the commonly reported periods being between five and fifteen days after birth.^{4,5} Factors that may alter this process of cord separation include delivery by caesarean section, antibiotic use, application of antiseptics to the cord, defective neutrophil mobility, and infection in the neonate.^{3,6}

Antiseptics have also been associated with delayed cord separation,⁷ besides making neonatal care more expensive. A study by Mugford *et al*⁸ indicated that in countries where mothers are visited by midwives during the postnatal period, problems with the cord often determine the number of visits.

Data on the pattern of umbilical cord stump care, separation time and the effect of different cord care regimens are useful for many reasons. They will guide health care providers in differentiating between normal and abnormal cord separation time in order to avoid unnecessary interventions, which may lead to neonatal morbidity and mortality especially in developing countries where the level of hygiene is low.⁴ It is also important in designing neonatal care programmes for mothers and other caregivers.

Mothers in Africa often worry and sometimes get quite anxious about the time it takes for the cord to fall off. As a result of this, different interventions are often practised to shorten the cord separation time. Although umbilical cord separation time and the effect of cord care practices and perinatal factors have been reported from Ibadan⁹ in southwest Nigeria, no such studies have been published from northern Nigeria, where the culture and climatic conditions are different.

It is against this background that we report the umbilical cord care and separation time in healthy

newborns in Kano, northern Nigeria. The aim is to establish the mean separation time and the effect of maternal and infant characteristics, perinatal factors and cord care practices on the cord separation time. We also sought to find out the mothers' sources of information about cord care and their perceived best cord care practices.

Materials and Methods

Setting

The study was conducted at the Infant Welfare Clinics of Aminu Kano Teaching Hospital, Kano and Murtala Mohammed Specialist Hospital, Kano. These are the two largest hospitals in metropolitan Kano. The study was conducted over a period of three months (October-December) in 2006. Mothers of all healthy newborns delivered during this period were eligible. Mothers whose babies had omphalocele or other related congenital abnormalities and those who required hospital admission for illnesses at birth, were excluded from the study. Informed consent was obtained from mothers before recruitment to the study. Permission was obtained from both hospital authorities and the institutional ethical committee of Aminu Kano Teaching Hospital. A standardized interviewer administered questionnaire was pretested and modified for clarity before being used to interview 600 mothers. Only mothers who had their babies within the preceding six weeks were interviewed to enhance recall. A pair of trained research assistants that were fluent in the local (Hausa) language administered the questionnaires at the two hospitals.

Information was obtained on the age and sex of the infant, antenatal care, gestational age at delivery, place of delivery, mother's parity, mode of delivery, birth weight, cord care practices and cord separation time.

Data analysis

The data was 'cleaned', validated and analysed using SPSS version 12.¹⁰ Quantitative variables were summarised using range, mean and standard deviation. Categorical variables were tabulated using frequencies and percentages. The student t test and Analysis of variance (ANOVA) were used for comparing means depending on the number of groups. Bonferonni's correction was applied for multiple comparisons. The level of significance for all tests was set at $P < 0.05$.

Result

Out of the 600 mothers requested to participate in the study, 577 (96.2%) accepted. The rest either declined consent or had exclusion criteria mainly due to admissions in the neonatal period. The babies of the respondents consisted of 277 (48.0%) males and 300 (52.0%) females. The time interval between birth and separation of the umbilical cord ranged from 2 to 14 days with a mean of 4.20 ± 1.70 days. The umbilical cord separated within the early neonatal period (1st week of life) in 95.8 percent of all infants, and the rest of the cords separated by the end of two weeks of life. Table 1.

Table 1 Time of Cord Separation and Baby's Gender (n=577)

Cord separation time (Days)	Males No(%)	Females No(%)	Total
2-4	195(50.9)	188(49.1)	383(66.4)
5-7	69(40.6)	101(59.4)	170(29.5)
8-10	12(57.1)	9(42.9)	21(3.6)
>10	1(33.3)	2(66.7)	3(0.5)
Total	277(48.0)	300(52.0)	577(100.0)

$\chi^2=0.38$ df=1 P=0.54 Range=2-14 days MeanSD [All=4.201.70; Males=4.10±1.69; Females=4.28±1.71] [t=-1.29 df=575 P=0.20]

There was no significant difference in cord separation time by gender. Three hundred and forty nine (60.9%) mothers applied methylated spirit, 145 (25.3%) hot compress, and 50 (8.7%) used toothpaste (*Macleans*). Other applications included herbal preparation in 20 (3.5%) and dusting powder in nine (1.6%) others.

Five hundred and sixty one (97.2%) mothers booked for antenatal care. Babies whose mothers had antenatal care had significantly longer cord separation time (t=2.52 df=575 P=0.023). Four hundred and fifty two (78.3%) of the babies were term, 20 (3.5%) were preterm and 105 (18.2%) post term. Babies delivered before 32 weeks of gestational age had significantly shorter cord separation time compared to more mature babies (F=4.4 df=3 P=0.002). Three hundred and eighty three (84.2%) of the babies had normal birth weight, 16 (3.5%) had low birth weight while 55 (12.1%) babies were macrosomic while one baby was of extreme low birth weight. Table 2

Table 2: Maternal and Infant Characteristics and Time of Cord Separation (n=577)

Characteristics	No. (%)	Cord Separation Time (days)				
		Mean	SD	t or F value	df	P value
<i>Antenatal care</i>						
Booked	561 (97.2)	4.22	1.71	2.52	575	0.023
Unbooked	16 (2.8)	3.38	1.31			
<i>Gestational age (wks)</i> (range 28 - 44 wks)						
<32	3 (0.5)	3.67	0.58	4.4	3	0.002
32-36	17 (2.9)	4.53	1.33			
37-42	452 (78.3)	4.32	1.79			
>42	105 (18.2)	4.04	1.86			
<i>Birth weight (kg)</i> (range 1.2- 5.9kg)						
<1.5	1 (0.2)	4.00	0.0	0.41	3	0.75
1.5-2.499	16 (3.5)	3.81	1.05			
2.5-4.0	383 (84.2)	4.28	1.82			
>4.0	55 (12.1)	4.18	11.61			

Though 577 mothers knew their approximate gestational ages by date, only 455 knew the birth weight of their babies, as 105 babies were delivered at home and 17 mothers could not recall the birth weights of their babies delivered in hospital. It is not uncommon in this environment to attend antenatal care which is free but to deliver at home because of cost implications. There was no significant relationship between the cord separation time and birth weight. Babies of primiparous mothers had significantly longer cord separation time compared to those of higher parity (F=3.53 df=4 P=0.007). Similarly, among educated mothers, the higher the level of education the longer the cord separation time (F=8.41 df=4 P=0.0001). Furthermore, babies of lower birth order had longer cord separation time compared to those of higher birth order (F=3.36 df=4 P=0.01).

Babies delivered by caesarean section had significantly longer cord separation time compared to those delivered spontaneously through the vagina. In contrast, assisted vaginal delivery (forceps or ventouse) was associated with shorter cord separation time compared to others methods of delivery. (F=5.55 df=2 P=0.004). Babies delivered at home had shorter cord separation time compared with those delivered in the hospital (F=11.07 df=2 P=0.0001).

The effects of certain perinatal factors on the mean cord separation time are shown in Table 3. There were 573 responses as 4 mothers had twins. It can be seen that the use of razor blade instead of hospital scissors to cut the cord, shortened separation time ($F=14.02$ $df=2$ $P=0.0001$). Similarly, the use of thread instead of plastic cord clamp to ligate the umbilical cord ($F=9.69$ $df=2$ $P=0.0001$) significantly shortened the cord separation time. Regarding cord treatment, babies whose cords were treated by the application of methylated spirit (alcohol) had the longest mean separation time. In contrast, those babies whose cords were treated with *Macleans* (toothpaste) had the shortest cord separation time. The separation time for those who used hot compress or herbal preparations were in between the other two. After controlling for the confounding effects of other variables, only maternal education and the instrument used for

cutting the umbilical cord at birth remained independent predictors of cord separation time as shown in table 4.

Regarding sources of knowledge about cord care, 363 (62.9%) of the mothers reported that health workers told them how to care for the cord during antenatal visits or before discharge from hospital following delivery. Others sources included their own mothers in 146 (25.3%) instances, their grandmothers in 40 (6.9%) and friends in 28 (4.9%) others. Respondents opined that even though they might not have used the option at birth, they thought the best cord care methods included methylated spirit (277; 48.0%), hot water compress (164; 28.4%), methylated spirit plus hot compress (67; 11.6%), *Macleans* toothpaste (29; 5.0%), herbal preparation (19; 3.3%), *Macleans* plus hot compress (16; 2.8%) and five (0.9%) mentioned dusting powder.

Table 3: Perinatal factors and cord care by age of cord separation

Characteristics	Cord Separation Time (days)				
	No. (%)	Mean	SD	t or F value	df P Value
<i>Instrument used to cut cord</i>					
Hospital scissors	338 (58.6)	4.50	1.81		
New blade	238 (41.2)	3.76	1.42	14.02	2 0.0001
Old blade	1 (0.2)	3.00	0.00		
<i>Cord 'clamp' used</i>					
Thread	332 (57.5)	3.94	1.57		
Plastic cord clamp	239 (41.4)	4.56	1.79	9.69	2 0.0001
Others	6 (1.0)	3.83	2.23		
<i>Cord treatment</i>					
Methylated spirit	349 (60.9)	4.54	1.84		
Hot compress	145 (25.3)	3.82	1.23		
<i>Macleans</i> tooth paste	50 (8.7)	3.12	1.22	11.77	4 0.0001
Herbal preparation	20 (3.5)	3.95	1.70		
Dusting powder	9 (1.6)	3.44	0.88		

NB Four mothers has twins.

Table 4: Predictors of Cord separation Time among Healthy Newborns in Kano

	Non-standardized		Standardized		
	Coefficients B	Std. Error	Coefficients Beta	T	P Value
(Constant)	4.500	0.444		10.138	0.001
Parity	-0.090	0.405	-0.128	-0.223	0.824
Mode of delivery	0.033	0.088	0.016	0.377	0.706
Maternal education	0.180	0.061	0.132	2.941	0.003
Cord cutting instrument	-0.454	0.168	-0.133	-2.702	0.007
Cord Clamp	-0.175	0.164	-0.053	-1.064	0.007

Discussion

The interval between birth and umbilical cord separation among newborns in Kano ranged from two to 14 days with a mean of 4.201.70 days. This is shorter than the mean separation time found in Ibadan, Nigeria (8.73.7 days),⁹ Ankara, Turkey (8.23.2 days)¹ and other developing countries.^{4,11} In addition, the mean separation time was much shorter than the figures reported from Europe⁴ and United States of America³ (13.9 days). The different cord care regimens had various effects on cord separation time as observed by earlier workers.^{6,8} For instance, we found significantly shorter separation time among babies whose cords were treated with hot compress, herbal preparation, Macleans (toothpaste) and dusting powder compared to those whose cords were treated with methylated spirit (alcohol). The differences in cord separation time could be attributed to the effect of unorthodox cord care practices coupled with the generally low level of hygiene, which probably resulted in higher rates of bacterial colonization, and early falling off of the umbilical cord.¹¹ Hayward et al reported that umbilical cord separation is mediated through leukocyte infiltration and digestion.¹² Another reason may be because of the very hot weather and low humidity in northern Nigeria. Recent evidence indicates that rubbing alcohol does not promote drying, is less effective against bacteria than other antimicrobials, and delays cord separation time^{4,13,14} however, it may reduce the incidence of omphalitis which remains a clinical issue, especially in developing countries.

In keeping with most previous studies, we did not observe significant differences in the mean cord separation time by gender.^{3,5} However, this finding contrasts with the report from Ibadan⁹, where a shorter cord separation time was found among male infants. It was observed that babies delivered by

Separation time compared to those who had spontaneous vaginal or assisted delivery. This was also reported by earlier workers^{3,5,15} who suggested that it could be a reflection of decreased bacterial contamination of the umbilical cord in those delivered by caesarean section with consequent decreased leukocyte migration to the cord.² This tends to be supported by reports indicating that umbilical cord separation is mediated through leukocyte infiltration and digestion.^{3,11,12} Therefore, interventions that limit cord contamination may cause significant delays in cord separation time.

In contrast to previous studies,^{4,5} we found significant effects of maternal booking status, gestational age, parity and types of instruments and ligatures used on cord separation time. Babies of booked mothers had longer cord separation time. This could be related to the increased likelihood of booked mothers to be informed about hygienic cord care practices. In addition, booked mothers are also more likely to deliver in hospital and have the umbilical cord cut with sterile hospital scissors, and to use methylated spirit (alcohol) as a means of cord care. Babies delivered preterm had shorter cord separation time that could be related to differences in immune response.

Cord care was not standardized in the centres where this study was conducted.

This is the reason for the varied cord treatment methods used. However, the majority of mothers used thread or plastic cord clamps. A WHO review⁴ reported that plastic cord clamps effectively close all vessels in the umbilical cord and are easy to use. However, they are more expensive and may not be easily available in the rural areas. Majority of mothers in the present study applied methylated spirit (alcohol) and this was associated with the longest mean separation time. This study found that a quarter of mothers applied heat treatment by using hot compress, which resulted in a shorter separation time. The danger here is not the heat itself, but the use of

Rags and heated soil, which may introduce bacterial spores leading to sepsis and tetanus.

Another interesting emerging method of cord care used by more than eight percent of mothers is the application of toothpaste to the cord stump. Babies of such mothers had the shortest mean separation time of 3.12 days. The ingredients of commonly used toothpastes in the study area include sorbitol, hydrated silica, fluoride and cellulose gum. The effects of these constituents on cord tissue need further evaluation. Similarly, the use of herbal preparations in cord care by some mothers may introduce toxic substances or lead to bacterial contamination of the cord. In order to prevent neonatal morbidity and mortality due to neonatal sepsis and tetanus, it is particularly important to inform mothers, especially primigravida on good cord care practices.

They should be instructed to keep the cord clean by washing with warm water and soap and exposing it to room air. They should not to apply any substance to the cord, and should seek medical attention if there are signs of swelling or redness in the peri-umbilical region or if there are systemic symptoms. In our study population, even among booked mothers, up to 38 percent of mothers said they were not informed about cord care during antenatal care. A high proportion (42.4%) of those who delivered in hospital said they were not taught how to care for the cord before discharge from hospital. These missed opportunities call for the development of strategies under the maternal-newborn continuum of care to reduce neonatal mortality in similar centres in developing Countries.

There seems to be no consensus on the best cord care practice. The Cochrane data base of systematic reviews concluded that “we are unable to be sure what is the best practice for cord care in institutions in developed countries” but there is no evidence that

doing anything better than keeping the cord clean is helpful”.¹⁶ Few interventions for cord care have been evaluated by randomized controlled trials. However, the following have been recommended: hand Washing before and after contact with the umbilical area, use of sterile instruments to cut the cord, keeping the cord clean and dry, water on cotton swabs may be used to clean the base of the cord, exposing the cord to air or covering loosely with loose clean cloth, folding the diaper below the level of the umbilicus and encouraging breast feeding and skin-skin contact with the mother to promote colonization with non pathogenic bacteria from the mother's skin flora.

This study has limitations. The first is that the study was hospital based. Therefore, participants are more likely to be educated, booked and to have delivered in hospital. Hence, our findings may not reflect all varieties of cord care practices in the community, particularly in relation to herbal substances applied to the umbilical stump. Similarly, although most communities in northwest Nigeria tend to have similar socio-cultural characteristics, other parts of northern Nigeria are not as homogenous; therefore, cord care practices may be different in those parts.

In conclusion, centres should identify safe, cheap and easy to follow guidelines for cord care. Since controlled trials have shown that cutting the cord with clean instruments, washing with clean warm water or cleaning the base with moist cotton wool and exposure to room air are effective ways of caring for the cord, healthcare workers should therefore encourage mothers to practise these in addition to exclusive breast feeding. The application of dangerous and untested substances to the umbilical stump should be discouraged while further investigations should be undertaken to determine the effects of these unorthodox substances on umbilical cord tissue.

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