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Original Article

Chlorhexidine Cleansing of the Umbilical Cord and Cord Separation Time: A Hospital Based Study in Bangladesh

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Abstract

Background: Cord separation time has evolved as an important justification for recommending against the topical use of chlorhexidine on the cord. **Objective:** This present study was undertaken to determine the impact of cord cleansing with chlorhexidine on cord separation time and maternal acceptance of chlorhexidine in umbilical cord care. **Methods:** Between April 2013 to July 2014, 340 newborns were randomly assigned within a tertiary level hospital in Bangladesh to receive 1 of 2 cord care regimens: clean and dry cord care (control) and single cord cleansing with 4% chlorhexidine. **Results:** The mean cord separation time in newborns of chlorhexidine group was significantly longer than dry cord care group ($p < 0.001$). Mother of newborns in chlorhexidine group more frequently reported "longer than usual" cord separation time. Overall satisfaction of mother with cord separation time was high (95.9%). **Conclusion:** Topical chlorhexidine significantly increased cord separation time. [*Journal of Science Foundation, 2015;13(2):27-30*]

Keywords: Chlorhexidine; umbilical cord separation; neonatal mortality

Introduction

Separation of umbilical cord stump is mediated by inflammation of the junction of the cord and the skin of the abdomen with leucocyte infiltration and subsequent digestion of the cord (WHO 1999). The cord normally falls off between 5 and 15 days after birth. Factors that delay the process are the application of antiseptics to the stump, infection and caesarean section (Zupan et al., 2004).

Umbilical cord cleansing with 4% chlorhexidine can substantially reduce neonatal mortality among newborn infants in low-resource settings with high risk of infection. Randomized trials in Nepal (Mullany et qal., 2006), Bangladesh (Arifeen et al., 2012) and Pakistan (Soofi et al., 2012) have demonstrated mortality reduction ranging from 6% to 38% among live-born infants receiving single or multiple cleansing within the first days of life. Cord separation time tends to be longer with the use of topical antiseptics, but such comparisons are mainly available in settings where infection risk is low (Zupan et al., 2004). In high –risk, low resource communities where infants are most likely to benefit from chlorhexidine cord cleansing, shifts

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in the distribution of cord separation time due to chlorhexidine remain uncharacterized. Community based data from Nepal showed that mean cord separation time among infants receiving chlorhexidine (5.32 days) exceeded that observed among infants not receiving chlorhexidine (Mullany et al., 2006). The difference was highly significant from a statistical perspective, but the absolute increase (~26 hours) was substantially less than reported between antiseptic and non-antiseptic groups studied in hospital-based studies and other low risk settings (Pezzati et al., 2002; Chamnanvanakij et al., 2005). It is unclear if this small difference was perceived by mothers and if so, whether perception of increased separation time might negatively affect the likelihood of widespread acceptance of the intervention in subsequent scale-up activities. The objective of the study was to quantify the impact of this intervention on cord separation time and the implications of such an increase on maternal acceptance of chlorhexidine.

Methodology

This was a randomized controlled trial carried out in the department of neonatology and department of obstetrics and Gynecology, Bangabandhu Sheikh Mujib Medical Universiy (BSMMU), Dhaka, from April 2013 to July 2014. The study protocol was approved by the Institutional Review Board (IRB), BSMMU. All term and preterm healthy newborns delivered during the study period were included. Preterm or any sick babies who need NICU admission, newborns with congenital malformations and newborns with sepsis risk factors and develop umbilical sepsis were excluded. A total of 340 newborns were enrolled and divided into two study groups (170 in each group) using a simple randomization method. Each study group was assigned to one of two cord care regimens. In Group 1: 7.1% Chlorhexidine digluconate solution (delivering 4% chlorhexidine) was applied as soon as possible after birth or within 24 hours of birth. After proper hand washing with soap and water, two sterile cotton balls was soaked with chlorhexidine solution. One cotton ball was used to gently cleanse the umbilical cord stump and another cotton ball was used to gently cleanse the base of the stump and the skin immediately around the base from center to periphery[3, 5]. Chlorhexidine was applied to the cord by the investigator in either OPD of department of Neonatology or in operation theater room of department of Obstetrics and Gynecology, BSMMU. Chlorhexidine solution (7.1% chlorhexidine digluconate delivered 4%chlorhexidine) used in the trial was prepared by diluting a 20% stock solution of aqueous chlorhexidine digluconate (ACI Limited, Dhaka, Bangladesh) with distilled water. The prepared chlorhexidine solution was packaged into 25 ml opaque bottles and were supplied to NICU, BSMMU with free of cost only for research purpose after ensuring 6 months stability test. In Group 2: promoted dry cord care messages recommended by WHO[1] and did not apply chlorhexidine to the cord. Educational messages about clean and dry cord care practice according to WHO were given to all parents or family members and also advised to follow it after application of chlorhexidine during the total neonatal period. All newborns of both groups were followed up in every alternate day until the complete separation of umbilical cord stump. All babies were directly supervised by concern physician during hospital stay or over mobile phone after discharge. Mothers of all newborns were asked for date and time of cord separation, cord separation time recognized as longer than usual or any dissatisfaction with the prolonged cord separation time and were recorded in each follow up visit. Newborns who developed umbilical infection during the follow up period were excluded from study. Mother was oriented about the signs of umbilical infection during the hospital stay with colored photograph of umbilical cord infection and report to concern physician if any. An informed written consent was obtained from parents or legal guardians of the babies. All demographic information and detailed history relevant to the research work were collected from the parents or other family members and from obstetrics record by a structured questionnaire and data collection sheet. Data were analyzed with the help of SPSS (Statistical package for social sciences) Version 20.0. Quantitative data were expressed as mean and standard deviation and comparison were done by independent unpaired student's t-test. Qualitative data were expressed as frequency and percentage. P value < 0.05 was considered statistically significant.

Results

A total of 340 newborn babies were included as study group according to the inclusion criteria. 170 of them were randomly allocated in single chlorhexidine cleansing group and 170 to clean and dry cord care group (control group). Seventeen newborns in single chlorhexidine and six newborns from clean and dry cord care group were dropped out due to incomplete follow up, needed admission to neonatal word for medical illness, application of local antibiotics/antiseptics or other harmful substances to the umbilicus and parents having

no interest to continue the research. Finally 153 newborns in single chlorhexidine cleansing group and 164 newborns in clean and dry cord care group (control group) were completed the study and final analysis included these newborns. The mean ±SD of gestational age in single chlorhexidine cleansing and control group was 38.4 ± 1.18 weeks and 38.4 ± 1.52 weeks respectively. The mean±SD of birth weight in single chlorhexidine cleansing and control group was 2907.45±420.2 grams and 2821.9±422.4 grams respectively.93.5% of newborns in single chlorhexidine group and 87.2% of control group were delivered by LUCS (Lower uterine cesarean section) and male to female ratio was almost identical (Table-1).

Table-1: Baseline characteristics of the study neonates.

Characteristics	Single chlorhexidine cleansing Group (n=153)	Clean &dry cord care group (n=164)	P Value
Gestational age (weeks)			
Mean ± SD	38.39±1.18	38.39±1.52	0.21
Mode of delivery			
NVD	10(6.5%)	21(12.8%)	0.09
LUCS	143(93.5%)	143(87.2%	
Birth weight (gm)			
Mean ±SD	2907.45±420.21	2821.9 ±422.4	0.84
Male : Female	1.2 : 1	1.12 : 1	

P value reached from unpaired 't' test

The mean cord separation time in chlorhexidine and dry cord care groups were 7.44 ± 3.75 and 4.83 ± 2.05 days after birth respectively. The mean cord separation time in newborns of chlorhexidine group was significantly longer than dry cord care group ($p < 0.001$) (Table-2).

Table 2: Cord separation time in different groups (n= 317)

Time (mean ± SD)	Single chlorhexidine cleansing group (n=153)	Clean & dry cord care group (n=164)	P value
Cord separation time in days	7.44 ± 3.75	4.83 ± 2.05	< 0.001

*P value reached from unpaired' test

Mother of newborns in chlorhexidine group more frequently reported "longer than usual" cord separation time like 32.7% & 9.7% in chlorhexidine and dry cord care group respectively.

Table 3: Mother's Perception on Cord Separation In Study Group

Cord care regimen	mother recognized prolong cord separation time	mother dissatisfaction on cord separation time	Total
Group 1	50(32.7%)	10 (6.5%)	153
Group 2	16(9.7%)	3 (1.8%)	164
Total	**66**	**13**	**317**

Overall satisfaction of mother with cord separation time (304 of 317, 95.9%) was high but dissatisfaction, when expressed, was more frequent in chlorhexidine cleansing group (6.5%) than the dry cord care group (1.8%) (Table-3).

Discussion

In this hospital based study, mean cord separation time was significantly prolonged in the chlorhexidine cleansing group (mean 7.44 days, difference = 2.61 days, $p < 0.001$) as compared to dry cord care group (mean 4.83 days). The present study finding was comparable with Nepal (Mullany et al., 2006) and Bangladesh (Arifeen et al., 2012) studies but differed with Pakistan (Soofi et al., 2012) study which showed no significant difference in the mean cord separation time between chlorhexidine group (mean 6.2 days) and dry cord care group (mean 6.0 days) but was not explained clearly. This difference was highly significant from a statistical perspective.

In this study, mean cord separation time was increased 2.61 days in chlorhexidine cleansing groups as compared to dry cord care. This prolonged cord separation time in chlorhexidine cleansing groups can be explained by the fact that the normal bacterial flora around the umbilicus play a major role in the separation of umbilical cord stump by infiltrating leucocyte and subsequent digestion of the cord and 4% chlorhexidine can cause destruction of normal flora around the umbilicus and a subsequent decrease in the number of leucocytes attracted to the cord (Novack et al., 1988). Chlorhexidine has residual effect; it binds tightly to the skin causing persistent reductions in bacterial colonization of the cord among the infants (Novack et al., 1988). Some mothers of infants (32.7%) in chlorhexidine cleansing group could detect this increase in cord separation time and expressed their anxiety about the prolonged cord separation time but these percentage was very low (6.5%). In this study overall satisfaction with the received cord care regimen was high (95.9%).

Conclusion

Topical chlorhexidine significantly increased cord separation time. Some mothers are likely to detect this increase and may express dissatisfaction with the cord care regimen but still accept the intervention overall.

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