

## CHAPTER 2

### REVIEW OF RELATED LITERATURE

Previous studies have been conducted to determine the effectiveness of different cord care regimens in term of bacterial colonization, infection, time to cord separation and parental satisfaction. The critical points summarized here are issues related to the treatment design in this study.

#### 2.1 Antiseptic or no antiseptic agent (Table 2)

All studies were conducted in term infants in developed countries. The purpose of the studies was to compare different regimens of cord care in hospital. Thus, most umbilical cultures were performed before hospital discharge. Outcome of umbilical cord care at home including bacterial colonization after discharge was described only in Speck's (3) and Janssen's (5) studies. Rate of bacterial colonization increased after birth but differences between the regimens with and without antiseptic decreased with time (3). In Janssen's study (5), infants using no antiseptic agent were more likely to be colonized with *Escherichia coli*, coagulase-negative staphylococci, *Staphylococcus aureus* and group B streptococci.

From the previous evidence, rate of bacterial colonization particularly with *Staphylococcus aureus* was higher in infants using no antiseptic. However, no study demonstrated the harm of clean cord care without antiseptic use (18) or the relationship between bacterial colonization and umbilical infection.

#### 2.2 Types of antiseptics (Table 3)

All studies evaluated the effectiveness of antiseptics by using rate of bacterial colonization as a primary outcome. Triple dye was shown to be the most effective antiseptics against staphylococcus but less effective against group B streptococci and gram-negative bacteria (3, 14). Alcohol was inferior to triple dye and chlorhexidine in controlling staphylococcal and group B streptococcal colonization (19).

#### 2.3 Time to cord separation (Table 4)

Previous studies of cord care regimens described time to cord separation ranging from 5.8 to 17.4 days. The differences of time to cord separation were depended on various antiseptics used. Factors affecting cord separation time such as bathing (20)

and mode of delivery (17, 20, 21) were described in only some studies. Thus, it was difficult to summarize the comparison of cord separation time.

Studies that applied nothing to the cord had the shortest mean cord separation time of about 6-8 days (7, 9, 22). Triple dye had the longest mean cord separation time ranging from 7.7 to 17.4 days (8, 16, 23, 24) whereas that of alcohol ranging from 6.4 to 13.9 days (7, 10, 16, 17, 25, 26).

#### **2.4 Factors affecting bacterial colonization and umbilical infection**

Bathing: There was no difference in staphylococcal colonization between total body wash and dry care (27).

#### **2.5 Factors affecting time to cord separation**

2.5.1 Mode of delivery: Cesarean section was shown to prolong cord separation time for 1.5-3 days compared to vaginal delivery (17, 20, 21)

2.5.2 Bathing: Bathing was shown to prolong cord separation time in an observational study (20)

2.5.3 Umbilical cord infection: One observational study (20) showed a significant correlation between cord separation time and umbilical infection. Whether delayed cord separation caused infection or infection prolonged cord separation" was still unclear.

#### **2.5 Satisfaction**

Several studies described maternal concern about umbilical cord and cord care after hospital discharge (11, 12). Parents universally expressed relief with cord separation (10). Regarding the type of an antiseptic used for cord care, parents disliked triple dye and stopped using it in one study (8). One study reported more satisfaction among nursing staff using alcohol for cord care compared to triple dye (10).

#### **2.6 Cost and workload**

One study reported money savings when using alcohol compared to triple dye (10). Delayed cord separation was reported to increase a number of home visits and workload of midwives (9).

#### **2.8 Summary of evidence**

In hospital, when rate of staphylococcal colonization and cross-infection was high, application of triple dye to cord stump was an appropriate strategies to prevent

staphylococcal colonization and cross-infection. However, the delay of cord separation time was one of the major concerns.

Alcohol was less effective than triple dye against pathologic bacteria. However, alcohol was more acceptable and had shorter cord separation time compared to triple dye.

Clean cord care without antiseptic use had high bacterial colonization rate, however the rate of umbilical infection was not different from cord care regimens with antiseptic use. Time to cord separation was shortest when no antiseptic agent was applied to umbilical stump.

Table 2.1 Comparisons between antiseptic and no antiseptic used for umbilical cord care

Author	N	Regimens of cord care	Culture (d)	colonization (%)	Bacteria	Infections during follow-up period
Pildes (1)	1,117	1. Triple dye (single) 2. 3% Hexachlorophene 3. Control	D 3	10.5 41.1 71.5	S. aureus	No report
Wald (2)	238	1. Triple dye once daily < 5 D 2. Hexachlorophene 3. Control	At discharge (D1-45)	1.0 6.4 8.4	GBS	Following GBS outbreak Cases of GBS osteomyelitis, meningitis and sepsis reported (group unspecified)
Speck (3)	257	1. Triple dye (single) 2. Silver sulfadiazine (single) 3. Control	D3 (D14, 42)	52.8 65.2 94.8	S.aureus GBS Gm- bacteria	No difference between groups (triple dye 0, silver sulfadiazine 1, control 1)
Barrett (14)	300	1. Triple dye (single) 2. Silver sulfadiazine (single) 3. Control	D 2	99 99 99	S. aureus, GBS, E.coli, Gm- bacteria	7 gastroenteritis, 1 upper respiratory tract infection, 1 paronychia and 1 omphalitis distributed equally among 3 groups
Meberg (28)	549	1. Benzine solution 2. 0.05% chlorhexidine 3. 4% chlorhexidine 4. Control	D 5-6	100 100 100 100	Staph. Strep. Gm- bacteria	No difference between groups (71 infections: 52 pemphigus, 23 conjunctivitis, 11 paronychia, 9 omphalitis)
Verber (4)	506	1. Hexachlorophene 2. Chlohexidine 3. Control	D 2	33 16 44	S. aureus	No report
Janssen (5)	589	1. Triple dye and then alcohol 2. Triple dye /control	2-3 D after discharge	84.3 98.7	Staph., Strep. Gm- bacteria	1 case of omphalitis in the control group

*S. aureus*: *Staphylococcus aureus*, GBS: group B streptococci, GM-: gram-negative, Staph: staphylococcus,

Strep: Streptococcus, D: day

Table 2.2 Comparisons between triple dye or alcohol and other antiseptics for cord care

Author	Method of allocation	Treatment	% colonization			Infection (cases)
			Staph.	GBS	Gm- bacteria	
Pildes (1)	Time schedule	1. Triple dye	10.5			No report
		2. Hexachlorophene	41.1			
DeLOACHE (15)	Time schedule	1. Triple dye	0			1 case (group unspecified)
		2. Alcohol	45.0			
		3. Povidone-iodine	54.0			
Wald (2)	Time schedule	1. Triple dye		1.0		No report
		2. Hexachlorophene		6.3		
Speck (3)	Randomly assigned	1. Triple dye	9.0	15.7	40.4	No difference
		2. Silver sulfadiazine	43.1	2.8	19.4	
Barrett (14)	Randomly assigned	1. Triple dye	15.0	40.0	90.0	No difference
		2. Silver sulfadiazine	54.0	27.0	52.0	
Andrich (13)	Time schedule	1. Triple dye	0.7			1 omphalitis 1 conjunctivitis
		2. Bacitracin	11.7			
Belfrage (19)	Time schedule	1. Alcohol	95.0	14.0	26.0	?
		2. Chlorhexidine	40.0	5.2	25.0	
Panyavudhikrai (16)	Time schedule	1. Triple dye	Omphalitis 4.2%			
		2. Alcohol	Omphalitis 10.7%			

GBS: group B streptococcus, Staph: staphylococcus, Gm- bacteria: gram-negative bacteria

Table 2.3 Comparisons of time to cord separation using different regimens of cord care

Author	Allocation	Treatment	N	separation time (d)	SD	SE	Range
Bhalla (20)	Observation	Mercurochrome or spirit or antiseptic powder	840	5.8			
Arad (23)	Randomly assigned	1. Triple dye	36	7.7		0.6	
		2. Neomycin ointment	26	12.0		0.8	
		3. Silver sulfadiazine	25	10.6		0.8	
		4. Bismuth subgallate	34	6.4		0.3	
Oudesluys-Murphy (29)	Observation	Dry gauze dressing	279	6.2	2.1		1-17
Mugford (9)	Randomly assigned	1. Powder (zinc, starch, talc)	199	6.3	1.7		
		2. No powder	202	8.1	2.4		
Novack (21)	Observation	Triple dye in hospital / Alcohol at home	363	13.9	4.7		3-45
Gladstone (8)	Randomly assigned	1. Triple dye (once daily)	14	17.4		1.8	13-29
		2. Single triple dye and then alcohol (daily)	53	12.5		0.6	6-23
		3. Single triple dye	48	12.9		0.6	8-26
		4. Silver sulfadiazine (daily)	42	13.8		0.6	7-22
		5. Povidone-iodine (daily)	44	9.8		0.5	4-17
		6. Bacitracin (daily)	48	11.8		0.7	5-25
Naor (25)	Observation	Alcohol	394	6.36	2.6		3-20
Sarwono (24)	Observation	Triple dye	98	10.9	3.0		5-23
Rais-Bahrami (26)	Observation	Alcohol (daily)	293	10.9			3-42
Dore (7)	Randomly assigned	1. Natural drying	Total	8.2			
		2. Alcohol (daily)	1811	9.8			
Hsu (17)	Randomly assigned	<u>In hospital</u>					
		1. Triple dye (daily)	76	16.7	0.7		
		2. Alcohol (daily)	97	12.6	0.5		
		<u>At home</u> (both groups) Alcohol once daily					
Golombek(10)	Time schedule	1. Single Triple dye and then alcohol (daily)	342	Median 13			2-37
		2. Alcohol (daily)	292	Median 10			2-34
Panyavudhi-krai (16)	Time schedule	1. Triple dye (twice daily)	213	13.6			
		2. Alcohol (daily)	214	11.5			