

ORIGINAL ARTICLE

Diaper dermatitis care of newborns human breast milk or barrier cream

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Aims and objectives. To establish the effectiveness of human breast milk and barrier cream (40% zinc oxide with cod liver oil formulation) applied for the skincare of newborns in the neonatal intensive care unit on the healing process of diaper dermatitis.

Background. Diaper dermatitis is the most common dermatological condition in newborns who are cared for in the neonatal intensive care unit. Recently, there are several kinds of complementary skincare methods suggested for newborns, such as sunflower oil, human breast milk, etc. Also, some chemical formulations are still being used in many neonatal intensive care units.

Design. Randomised controlled, prospective, experimental.

Methods. This study was carried out with a population including term and preterm newborns who developed diaper rash while being treated in the neonatal intensive care unit of a university hospital in Istanbul between February–October 2010. On completion of the research, a total of 63 newborns from human breast milk ($n = 30$) and barrier cream ($n = 33$) groups were contacted.

Results. Genders, mean gestation weeks, feeding method, antibiotic use, diaper area cleansing methods, diaper brands and prelesion scores of newborns in both groups were found to be comparable ($p > 0.05$). There was no statistically significant difference ($p = 0.294$) between the groups in terms of mean number of clinical improvement days, but postlesion score of the barrier cream group was statistically significantly lower ($p = 0.002$) than the human breast milk group.

Conclusion. Barrier cream delivers more effective results than treatment with human breast milk, particularly in the treatment of newborns with moderate to severe dermatitis in the result of the study.

Relevance to clinical practice. This study will shed light on nursing care of skin for newborns who are treated in neonatal intensive care unit.

Key words: barrier cream, cod liver oil, diaper dermatitis, human breast milk, newborn, neonatal intensive care unit, nursing care, skin, zinc oxide

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Introduction

Diaper dermatitis is a skin disorder in the perineal, perianal and surrounding area caused by lack of fresh air, dampness and irritation (Samancı 2007, Savaşer 2007). With prevalence

from 7–35% in newborns, this skin disorder typically develops between the 9th–12th month (Ehretzman *et al.* 2001, Wolf *et al.* 2001, Alberta *et al.* 2005, Shin 2005, Önder *et al.* 2007, Rowe *et al.* 2008). Diaper dermatitis is the most common dermatological condition in infancy. Macera-

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tion by water is the most critical predisposing factor leading to diaper dermatitis. Prolonged exposure of the skin to faecal enzymes (urea, protease, lipase) results in the impairment of the integrity of epidermis (Scheinfeld 2005, Lane *et al.* 2007).

The cause of diaper dermatitis is the irritation of the skin as a result of exposure to dampness and friction. Infrequent diaper change causes pH of the urine-exposed skin to change from acidic to alkaline, resulting in the colonisation of the skin by microorganisms. Alkaline pH activates protease and lipase enzymes in faeces and impairs the stratum corneum (Scheinfeld 2005, Houska-Lund & Durand 2006, Visscher & Hoath 2006, Samancı 2007). Sustained contact of the skin with urine increases skin permeability and results in irritation (Scheinfeld 2005). Initial clinical symptoms of diaper dermatitis may be skin dehydration. In the early period, erythema, slight maceration and oedema are observed. The lesion tends to spread in time, with aggravated erythema and maceration. In the severe phase, ulcerations and erosions develop in erythematic areas. Secondary infections may develop involving bacteria such as *Candida albicans* in the late period (Scheinfeld 2005, Önder *et al.* 2007).

Treatment of diaper dermatitis focuses on two major objectives: accelerate the healing of damaged skin, and prevent recurring rash (Atherton 2004). In the treatment process, diapers must be changed more often (hourly in newborn phase and every 3–4 hours in infancy), allowing baby's bottom to get fresh air, diaper brand must be changed if necessary, skin must be let dry fully after cleaning and a thick layer of zinc oxide formulations must be applied. If skin is infected with *C. albicans*, use of corticosteroid-free antifungal ointments is recommended (Wolf *et al.* 2001, Shin 2005, Önder *et al.* 2007).

Today, barrier creams such as zinc oxide, petrolatum are used to protect skin against diaper dermatitis, prevent development of diaper dermatitis and to treat conditions of diaper dermatitis. Zinc oxide and petrolatum form a lipid film on the skin surface, which repairs stratum corneum and prevent irritation of the skin (Scheinfeld 2005, Rowe *et al.* 2008).

Human breast milk protects newborns from bacteria, viruses and fungi through its anti-inflammatory effect produced by its content of lactoferrin, lymphocyte, prostaglandin, bifidus factor, bioactive components and growth factors. Epidermal growth factor (EGF), the major growth-promoting factor in human breast milk, builds a mucosal barrier through cellular proliferation against antigens. EGF was topically used to treat burns, scars, ulcerations and corneal injuries (Penjvini *et al.* 2009).

The trial was planned to establish the effectiveness of human breast milk and barrier cream containing 40% zinc

oxide and cod liver oil applied for the skincare of newborns in the newborn intensive care unit, with developing skin rash, on the healing process of diaper dermatitis.

Materials and methods

Sample and setting

The research was originally planned as a randomised controlled prospective experimental study to establish the effectiveness of human breast milk and barrier cream containing 40% zinc oxide and cod liver oil applied for the skincare of newborns in the neonatal intensive care unit (NICU), with developing skin rash, on the healing process of diaper dermatitis.

The population of the trial included term and preterm newborns who developed diaper dermatitis while being treated in the NICU of University of Istanbul, Faculty of Medicine Hospital between February 2010–October 2010. The NICU where the study was conducted consisted of two sections: level II and level III. Infants with disorders such as spina bifida, metabolic diseases, respiratory distress syndrome, hydrops fetalis, congenital heart diseases, meconium aspiration syndrome, hypoglycemia, asphyxia were being treated in the NICU. The equipment in the NICU was composed of 28 incubators, two radiant warmers, 12 ventilators and one CPAP unit. Infants younger than 32 weeks of gestation were mostly receiving total parenteral nutrition (TPN). The NICU typically hosted infants who were on antibiotics and one nurse provided care for two to three infants.

It was planned to enrol in the study all infants who developed diaper dermatitis while being treated in the NICU. In the data collection process, 70 infants were observed to develop dermatitis; of a total of 70 infants, parents of three declined to participate in the study and four infants were excluded from the study as they were discharged as part of their treatment process. It was determined that at least 24 subjects must have been assigned to each group to demonstrate the significance of 1 degree difference between the barrier cream group and human breast milk group for 80.7% power ($\alpha = 0.05$ and $\beta = 0.19$). Newborns were allocated to barrier cream and human breast milk groups using a simple randomisation method. As required by the selected randomisation method (toss-up), the randomisation period was extended to get comparable number of infants in each group, and a total of 63 infants were included in the sample, resulting in 30 participants in the human breast milk group and 33 in the barrier cream group.

Data collection tool

As a data collection tool, the observation form prepared by the researchers and approved by specialists was used. The observation form consisted of 15 items, five of which dealt with the gestational age, gender, diagnosis, birth height and weight, whereas the remaining 10 requested information on the care of the newborn with diaper dermatitis (feeding method, use of antibiotics, diaper area cleaning method, lesion score, type of treatment and healing period).

Data collection

In the first place, the researchers made a preliminary assessment of diaper dermatitis using the 4-point global clinical impression scale (0 = none, 1 = slight erythema, 2 = erythema over a large area and 3 = erythema over a deeper and larger area) (Concannon *et al.* 2001). This was followed by the completion of the observation form. Newborns were divided into two groups: human breast milk and barrier cream. For dermatitis care of newborns in the human breast milk group ($n = 30$), breast milk of mothers was applied on their own baby during each diaper change. Dermatitis care of newborns in the barrier cream group ($n = 33$) involved the application of barrier cream containing 40% zinc oxide and cod liver oil. Condition of dermatitis in neonates was daily observed during treatment period. A minimum of 1-point decrease in the dermatitis score was considered to indicate 'improvement'. Both caring methods were employed for a maximum period of five days. Diapers were changed every three hours (eight times a day). Water-soaked alcohol-free cotton wipes were used to clean the diapered area of newborns in both groups. Following the trial period, a final evaluation was made. The postlesion score was established as 1 for slight erythema, 2 for erythema in a large area, 3 for erythema in a deeper and larger area and 0 for complete healing.

Data analysis

Data from the trial were electronically evaluated using the program SPSS, version 15.0 (SPSS Inc., Chicago, IL, USA). Statistical analyses used percentage, median, chi-square and student *t* tests, and the level of statistical significance was set at $p < 0.05$ (Özdemir 2006).

Ethical considerations

Prior to the start of the research, written permissions were obtained from the local ethics committee of the University of Istanbul, Faculty of Medicine Hospital where the trial

would take place, and the department under which the NICU operated. The purpose of the study was explained to all newborns' mothers in written form in a cover letter informed about the type and time of dermatitis care. Participation in the study was voluntary.

Results

Table 1 shows the individual properties (gender, term/preterm condition, mean gestation week, feeding method, TPN, ventilation, antibiotic use, diaper area cleaning method, treatment method, number of days of clinical improvement, pretreatment and posttreatment lesion scores) of newborns treated in the NICU and developing diaper dermatitis.

When Table 1 is examined, it was seen that 52.4% of infants in the NICU who developed dermatitis were female, mean gestational age of study group was 34.79 ± 2.86 weeks, the majority of infants (60.3%) were preterm, 57.1% were being exclusively breastfed, 14.3% were receiving TPN, the majority of them (68.3%) were on antibiotics, water-soaked wipe was used to clean the diaper area of 84.1% of them, 52.4% of infants were treated with barrier cream and 47.6% with human breast milk, mean clinical improvement days of infants were 3.67 ± 1.14 , pre-treatment lesion score of 49.2% of infants was '2' (erythema over a large area) and posttreatment lesion score of 77.8% was '0' (complete recovery).

Table 2 compares certain characteristics of newborns in the NICU who developed dermatitis by selected treatment method. Examination of data revealed no statistically significant difference between the treatment groups (barrier cream group and human breast milk group) with respect to gender, term/preterm condition, feeding method, TPN, antibiotic use, diaper area cleaning method, prelesion score, gestational age and period of clinical improvement ($p > 0.05$).

Table 3 reflects the improvement rates achieved with treatment methods (human breast milk/barrier cream) used in newborns in the NICU who developed dermatitis, and distribution of certain characteristics. When data in Table 3 are analyzed, gender, term/preterm condition, feeding method, TPN, use of antibiotics, diaper area cleaning method and prelesion score were found not to have a statistically significant effect on the improvement of dermatitis ($p > 0.05$). It was seen that the condition of dermatitis was improved in 60% ($n = 18$) of infants treated with human breast milk and 93.6% ($n = 31$) of infants treated with barrier cream. Barrier cream was determined to affect improvement positively at a statistically more significant

Table 1 Identifying characteristics of newborns with developing diaper dermatitis ($n = 63$)

Parameters	<i>n</i>	%
Gender		
Male	30	47.6
Female	33	52.4
Term/preterm condition		
Term	25	39.7
Preterm	38	60.3
Mean gestational week (X ± SD)	34.79 ± 2.86 (Min: 25, Max: 39)	
Feeding method		
Exclusive breastfeeding	36	57.1
Exclusive formula feeding	4	6.3
Breastfeeding and formula feeding	5	7.9
Breastfeeding and nutrient-enriched formula	16	25.4
Exclusive TPN	2	3.2
TPN		
No	54	85.7
Yes	9	14.3
Ventilation		
Yes	3	4.8
No	60	95.2
Use of antibiotics		
Yes	43	68.3
No	20	31.7
Cleaning method		
Water-soaked wipe	53	84.1
Alcohol-containing wipe	10	15.9
Treatment method		
Human breast milk	30	47.6
Barrier cream	33	52.4
Mean improvement period (day) (X ± SD)	3.67 ± 1.14 (Min: 1, Max: 5)	
Pretreatment lesion score		
1: Slight erythema	21	33.3
2: Erythema over a large area	31	49.2
3: Erythema over a larger and deeper area	11	17.5
Post-treatment lesion score		
1: Slight erythema	1	1.6
2: Erythema over a large area	7	11.1
3: Erythema over a larger and deeper area	6	9.5
4: Complete recovery	49	77.8

TPN, total parenteral nutrition.

Table 2 Comparison of newborns characteristics by treatment method ($n = 63$)

Parameters	Treatment method				Significance	
	Human breast milk		Barrier cream		χ^2	<i>p</i> *
	<i>n</i>	%	<i>n</i>	%		
Gender						
Female	19	63.3	14	42.4	1.980	0.159
Male	11	36.7	19	57.6		
Term/preterm condition						
Term	9	30.0	16	48.5	1.537	0.215
Preterm	21	70.0	17	51.5		
Feeding method						
Breastfeeding	18	60.0	18	54.5	0.033	0.856
Other [†]	12	40.0	15	45.5		
TPN						
Yes	6	20.0	3	9.1		0.700
No	24	80.0	30	90.9		
Use of antibiotics						
Yes	17	56.7	26	78.8	2.601	0.107
No	13	43.3	7	21.2		
Cleaning method						
Water-soaked wipe	28	93.3	25	75.8		0.085
Alcohol-containing wipe	2	6.7	8	24.2		
Pretreatment lesion score						
Slight erythema	11	36.7	10	30.3	0.752	0.685
Erythema over a large area	15	50.0	16	48.5		
Erythema over a larger and deeper area	4	13.3	7	21.2		
Gestational age (week) (X ± SD)	34.23 ± 2.21		35.30 ± 3.30		<i>t</i> = 1.496;	
Improvement period (day) (X ± SD)	3.50 ± 1.17		3.82 ± 1.10		<i>t</i> = 1.113;	
					<i>p</i> = 0.270	

* $p > 0.05$.[†]Distribution of other feeding methods is provided in Table 1. χ^2 , chi-square tests (Pearson chi-square test, Fisher's exact test, continuity correction); *t*, independent samples test.

TPN, total parenteral nutrition.

level when compared with human breast milk ($p = 0.002$; $p < 0.01$).

In Table 4, certain characteristics of newborns in the NICU who developed dermatitis were explored based on term/preterm condition. Examination of data in the table revealed no statistically significant difference between term and preterm infants with respect to gender, feeding method,

Table 3 Comparison of newborns characteristics by clinical improvement ($n = 63$)

Parameters	Response to treatment					
	Improvement		No improvement		Significance	
	n	%	n	%	χ^2	p^*
Gender						
Female	23	69.7	10	30.3	–	0.136
Male	26	86.7	4	13.3		
Term/preterm condition						
Term	18	72.0	7	28.0	0.342	0.559
Preterm	31	81.6	7	18.4		
Feeding method						
Breastfeeding	30	83.3	6	16.7	0.844	0.358
Other [†]	19	70.4	8	29.6		
TPN						
Yes	8	88.9	1	11.1	–	0.670
No	41	75.9	13	24.1		
Use of antibiotics						
Yes	32	74.4	17	25.6	–	0.518
No	11	85.0	3	15.0		
Cleaning method						
Water-soaked wipe	40	75.5	13	24.5	–	0.434
Alcohol-containing wipe	9	90.0	1	10.0		
Pretreatment lesion score						
Slight erythema	19	90.5	2	9.5	5.397	0.067
Erythema over a large area	24	77.4	7	22.6		
Erythema over a larger and deeper area	6	54.5	5	45.5		
Treatment method						
Human breast milk	18	60.0	12	40.0	–	0.002*
Barrier cream	31	93.6	2	6.1		

* $p < 0.01$.

[†]Distribution of other feeding methods is provided in Table 1. χ^2 , chi-square tests (Pearson chi-square test, Fisher's exact test, continuity correction).

TPN, total parenteral nutrition.

TPN, use of antibiotics, diaper area cleaning method and prelesion score ($p > 0.05$). Contrary to expectations, improvement period of term infants was longer than that of preterm infants, but no statistically significant difference was found to exist between term and preterm infants ($t = 1.059$; $p = 0.294$).

Table 5 compares certain characteristics of enrolled neonates with respect to improvement by selected treatment method. Review of data indicated.

Table 4 Comparison of newborns characteristics by term/preterm condition ($n = 63$)

Parameters	Term/preterm condition					
	Term		Preterm		Significance	
	n	%	n	%	χ^2	p^*
Gender						
Male	15	50.0	15	50.0	1.791	0.181
Female	10	30.3	23	69.7		
Feeding method						
Exclusive breastfeeding	17	47.2	19	52.8	1.328	0.249
Other [†]	8	29.6	19	70.4		
TPN						
No	24	44.4	30	55.6		0.075
Yes	1	11.1	8	88.9		
Use of antibiotics						
Yes	18	41.9	25	58.1	0.058	0.809
No	7	35.0	13	65.0		
Cleaning method						
Water-soaked wipe	19	35.8	34	64.2	1.165	0.280
Alcohol-containing wipe	6	60.0	4	40.0		
Pretreatment lesion score						
Slight erythema	12	57.1	9	42.9	4.194	0.123
Erythema over a large area	9	29.0	22	71.0		
Erythema over a larger and deeper area	4	36.4	7	63.6		
Improvement period (day) (Mean \pm SD)	3.48 \pm 1.16		3.79 \pm 1.12		$t = 1.059$	$p = 0.294$

* $p > 0.05$.

[†]Distribution of other feeding methods is provided in Table 1. χ^2 , chi-square tests (Pearson chi-square test, Fisher's exact test, continuity correction); t , independent samples test.

TPN, total parenteral nutrition.

Improvement in 33.3% of infants who developed dermatitis and who were treated with human breast milk ($n = 3$); 93.8% of infants treated with barrier cream ($n = 15$); 71.4% of preterm infants with dermatitis who were treated with human breast milk ($n = 15$); and 94.1% of infants treated with barrier cream ($n = 16$). It was seen that barrier cream, used as a treatment for dermatitis in term infants, was statistically significantly more effective than treatment with human breast milk ($p = 0.003$).

Table 5 Comparison of newborns characteristics by effectiveness of treatment methods ($n = 63$)

Parameters	Treatment method	Response to treatment				Significance <i>p</i>
		Improvement		No improvement		
		<i>n</i>	%	<i>n</i>	%	
Term/preterm condition						
Term	Human breast milk	6	66.7	3	33.3	0.003**
	Barrier cream	1	6.3	15	93.8	
Preterm	Human breast milk	6	28.6	15	71.4	0.104
	Barrier cream	1	5.9	16	94.1	
Use of antibiotics						
Yes	Human breast milk	9	52.9	8	47.1	0.003**
	Barrier cream	2	7.7	24	92.3	
No	Human breast milk	3	23.1	10	76.9	0.521
	Barrier cream	0	0.0	7	100.0	
Pretreatment lesion score						
Slight erythema	Human breast milk	2	18.2	9	81.8	0.476
	Barrier cream	0	0.0	10	100.0	
Erythema over a large area	Human breast milk	6	40.0	9	60.0	0.037*
	Barrier cream	1	6.3	15	93.8	
Erythema over a larger and deeper area	Human breast milk	4	100.0	0	0.0	0.015*
	Barrier cream	1	14.3	6	85.7	
Feeding method						
Breastfeeding	Human breast milk	6	33.3	12	66.7	0.019*
	Barrier cream	0	0.0	18	100.0	
Other	Human breast milk	6	50.0	6	50.0	0.087
	Barrier cream	2	13.3	13	86.7	

* $p < 0.05$; ** $p < 0.01$.

χ^2 , Fisher's exact test.

TPN, total parenteral nutrition.

There was improvement in 47.1% of infants who were on antibiotics and treated with human breast milk ($n = 8$); 92.3% of infants treated with barrier cream ($n = 24$); 76.9% of infants who were not on antibiotics and who were treated with human breast milk ($n = 10$); and 100% of infants who were treated with barrier cream ($n = 7$). It was seen that rate of improvement in infants on antibiotics who were treated with barrier cream was statistically significantly higher than the rate of improvement in infants who were treated with human breast milk ($p = 0.003$).

Although there was no statistically significant difference between treatment methods of dermatitis in infants with a dermatitis prelesion score of 1 (slight erythema) with respect to effectiveness in healing dermatitis ($p = 0.476$), barrier cream was established to be statistically significantly more efficient than breast milk in the treatment of dermatitis in infants with a dermatitis prelesion score of 2 (erythema over a large area) and 3 (erythema over a deeper and larger area) ($p < 0.05$).

When improvement of dermatitis was explored by feeding method of infants treated for dermatitis, it was determined

that barrier cream selected as the treatment method for infants who were exclusively breastfed was statistically significantly more efficient than human breast milk in treatment ($p = 0.019$). It was observed that there was no statistically significant correlation between other feeding methods and treatment of dermatitis ($p = 0.87$).

Discussion

Diaper dermatitis is the most common dermatological condition in infancy, which may be observed with all newborns who are diapered (Ward *et al.* 2000). Literature reports that the incidence of diaper dermatitis was affected by numerous factors including gender, age, feeding method, material used to cleanse the diapered area, use of antibiotics, etc. (Ward *et al.* 2000, Alberta *et al.* 2005, Scheinfeld 2005).

In the light of the foregoing information, study data were discussed as regards the characteristics of infants, such as term/preterm condition, antibiotic use, feeding method and improvement.

Term/preterm condition

When preterm and term infants are compared in regard to their skin development, skin permeability is higher, stratum corneum is thinner and barrier function is less developed in preterms (Darmstadt & Dinulos 2000). The comparison of term and preterm infants enrolled in the study as regards the treatment method showed no statistical difference between groups and that there was no difference between the groups with respect to mean gestation week and term/preterm condition. It was also determined that prelesion scores of the groups were not different (Table 2). In addition, further comparison showed no difference between term and preterm infants with respect to factors likely to affect development of dermatitis, including feeding method, TPN, use of antibiotics and diaper area cleaning method (Table 4). While we found no statistical difference between term and preterm infants with respect to improvement condition (Table 3), term infants treated with barrier cream, evaluated within the group of term infants only, were seen to respond to treatment at a statistically significantly higher level when compared with term infants treated with human breast milk ($p = 0.003$; Table 5).

Feeding method

Literature reports reduced levels of dermatitis in infants who are breastfed (Penjvini *et al.* 2009). When the distribution of enrolled infants between the groups is examined with respect to feeding method, it was determined that the majority of infants were being breastfed (Table 1), but there was no statistically significant difference between the groups with respect to feeding method (Table 2). However, when breastfed infants were compared based on treatment method, it was seen that improvement in infants treated with barrier cream was statistically significantly better than improvement in infants treated with human breast milk ($p = 0.0019$; Table 5). This finding was thought to be associated with positive effect of breastfeeding on treatment, which facilitates improvement, as well as with high effectiveness of barrier cream in treatment.

Use of antibiotics

Literature reports that use of antibiotics may cause diaper dermatitis (Concannon *et al.* 2001). The majority of infants enrolled in the study were on antibiotics (68.3%); however, the distribution of infants on antibiotics was statistically similar in both treatment groups (Table 2). No statistically significant difference was found between term

and preterm infants with respect to antibiotic use (Table 4). Although no difference was found related to the effectiveness of treatment method in infants who were not using antibiotics, it was statistically established that barrier cream was more effective in treating dermatitis in infants who were on antibiotics ($p = 0.003$; Table 5). This was thought to be associated with higher prelesion score observed in infants on antibiotics and greater clinical effectiveness with barrier cream in infants with erythema over a large area or erythema over a deeper and larger area. Findings from comparison of clinical effectiveness by prelesion score also supported this judgment ($p < 0.05$; Table 5).

Effect of treatment method on clinical improvement of dermatitis

No statistical difference was found between infants treated with human breast milk and infants treated with barrier cream, with respect to prelesion score (Table 2). When infants with a prelesion score equal to and above 2 (erythema over a large area and erythema over a deeper and larger area) were compared as regards the treatment method, barrier cream was found to be more effective in treatment. There is no statistical difference between clinical effectiveness of treatment methods in newborns with slight erythema (Table 5). Besides, these findings were backed by the observation that barrier cream was more effective in clinical improvement across all study group (Table 3). When clinical improvement of infants was evaluated based on duration, no difference was found between groups (Table 2). This finding was thought to be associated with the consideration of a decrease by one point in lesion score as improvement and recording of diaper area observations as number of days.

Exploration of literature revealed only one study (Penjvini *et al.* 2009) where methods similar to those employed in this trial were used. This similarity was associated with the fact that this study had been conducted in Middle East and use of human breast milk to treat diaper dermatitis is a conventional practice in this region, just like it is in Turkey. In the study of Penjvini *et al.* (2009) where zinc oxide ointment and human breast milk were compared, it was reported that there were no differences between the groups with respect to lesion size, erythema and inflammation; however, prelesion and postlesion scores of groups differed in favour of the human breast milk, which may be used for rash treatment with consideration given to its availability and convenience. Although the results of this trial where combination of 40% zinc oxide and cod liver oil was

shown to be more effective in rash treatment differ from those of the study of Penjvini *et al.* (2009), the difference between the pre/postlesion scores of two studies was associated with the fact that zinc oxide concentration of the formulation was not indicated in the latter and this formulation did not contain any cod liver oil.

Rowe *et al.* (2008) conducted a systematic study to examine the evidence-based clinical effectiveness of barrier preparations in preventing and treating diaper dermatitis in diapered children and reported unavailability of any piece of literature devoted to a placebo-controlled study on barrier creams with zinc oxide. Our reviews of literature conducted under the trial revealed no other study comparing the healing effect of barrier cream containing 40% zinc oxide and cod liver oil with that of human breast milk.

In the study of Arad *et al.* (1999), hospitalised children who developed diaper dermatitis were treated with three different methods, and assessed improvement of diaper dermatitis with scores from 0–5 for a period of five days. It was reported that the percentage of improvement in children who were treated with eosin was 61%, in children who were treated with 47% zinc oxide/cod liver-containing formulation 22% and children who were treated with corticosteroid cream 33% in this study, and eosin was statistically significantly more effective in the treatment of diaper dermatitis.

This study showed that application of barrier cream formulation proved more effective than human breast milk in the treatment of diaper dermatitis. This result was similar to those obtained from the study of Baldwin *et al.* (2001) with respect to clinical effectiveness of zinc oxide formulation in the treatment of diaper dermatitis. When we compared this study with the study by Arad *et al.* (1999), we thought that the difference between the results obtained from these two studies was due to dissimilarity of methods used to treat diaper rash and assessment criteria.

Baldwin *et al.* (2001), in their study comparing a diaper with 40% zinc oxide/petrolatum formulation with a formulation-free diaper, reported a statistically significant reduction in rash development with newborns using 40% zinc oxide/petrolatum formulation diapers in comparison with those using formulation-free diapers.

Conclusion

Although it was seen from the study that barrier cream delivers more effective results than treatment with human breast milk, particularly in the treatment of newborns with moderate to severe dermatitis, due to the scarcity of literature available regarding this subject, it was thought that experimental studies involving larger sample sizes to

compare different methods in rash treatment and confirmation of treatment method with evidence-based research results were required.

Relevance to clinical practice

Use of antibiotics and chemical skincare formulations in NICU is known to cause skin conditions in infants. Therefore, proactive prevention of dermatitis in term and preterm newborns, with underdeveloped stratum corneum, is of paramount importance for both skin health and general well-being of infants. As zinc oxide is a chemical, use of this chemical in newborns must be avoided as far as possible. However, clinical improvement of dermatitis seems to be difficult without non-chemical methods, particularly when moderate to severe dermatitis develops. In the light of data from this study and from literature, suggestions for protecting newborn skin health and preventing occurrence of diaper dermatitis may include limiting use of chemical skincare formulations and antibiotics, changing diapers frequently, allowing newborn's bottom to get more fresh air, preferring diapers with high absorbance capacity, putting diapers on loosely, avoiding use of talc to prevent damage to respiratory tract, preferring cleansing the diaper area with warm water or water-soaked wipes instead of using alcohol-containing disposable wipes, giving the baby daily baths, adding oil to bath water to moisturise the skin, applying a thin layer of barrier creams with zinc oxide after cleaning the diaper area, evaluating the skin frequently in infants on antibiotics and treating any slight erythema with human breast milk as soon as it is spotted.

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Contributions

Study design: DG, SC; data collection and analysis: SB, FA, DG, SC and manuscript preparation: DG, SC.

Conflict of interest

We certify that there is no conflict of interest regarding the submission and publication of the manuscript and its potential implications.

References

- Alberta L, Sweeney SM & Wiss K (2005) Diaper dye dermatitis. *Pediatrics* **116**, 450–452.
- Arad A, Mimouni D, Ben-Amir D, Zeharia A & Mimouni M (1999) Efficacy of topical application of eosin compared with zinc oxide paste and corticosteroid cream for diaper dermatitis. *Dermatology* **199**, 319–322.
- Atherton DJ (2004) A review of the pathophysiology, prevention and treatment of Irritant Diaper Dermatitis. *Current Medical Research and Opinion* **20**, 645–649.
- Baldwin S, Odio MR, Haines SL, O'Connor RJ, Englehart JS & Lane AT (2001) Skin benefits from continuous topical administration of a zinc oxide/petrolatum formulation by a novel disposable diaper. *Journal of the European Academy of Dermatology and Venereology* **15**, 5–11.
- Concannon P, Gisoldi E, Phillips S & Grossman R (2001) Diaper dermatitis: a therapeutic dilemma results of a double-blind placebo controlled trial of miconazole nitrate 0.25%. *Pediatric Dermatology* **18**, 149–155.
- Darmstadt GL & Dinulos JG (2000) Neonatal skin care. *Pediatric Clinics of North America* **47**, 757–782.
- Ehretzman C, Schaefer P & Adam R (2001) Cutaneous tolerance of baby wipes by infants with atopic dermatitis and comparison of the mildness of baby wipe and water in infant skin. *Journal of European Academy of Dermatology and Venerology* **15**, 16–21.
- Houska-Lund C & Durand DJ (2006) Skin and skin care. In *Handbook of Neonatal Intensive Care*, 6th edn (Merenstein GB & Gardner SL eds). Mosby Elsevier, St Louis, MO, pp. 447–466.
- Lane A, Wood AH & Ward VE (2007) Diaper dermatitis. In *Neonatal Skin Care Evidence-Based Clinical Practice Guideline*, 2nd edn. Association of Women's Health, Obstetric and Neonatal Nurses, Washington, DC, pp. 33–37.
- Önder M, Adışen E & Velagiç Z (2007) Diaper dermatit (Diaper dermatitis). *Çocuk Sağlığı ve Hastalıkları Dergisi* **50**, 129–135 [in Turkish].
- Özdemir O (2006) *Medikal İstatistik (Medical Statistic)*. İstanbul Medikal Yayıncılık, İstanbul [in Turkish].
- Penjvini S, Shahsavari S, Gazerani F & Abdolkavand S (2009) Topical use of human breast milk for diaper rash in infants. *Middle East Journal of Nursing* **3**, 27–30.
- Rowe J, DipHSc PG, McCall E & Kent B (2008) Evidence synthesis: clinical effectiveness of barrier preparations in the prevention and treatment of nappy dermatitis in infants and preschool children of nappy age. *Journal of Evidence-Based Healthcare* **6**, 3–23.
- Samancı N (2007) Yenidoğanın genel bakımı prensipleri (Principle of newborn's care). In *Neonatoloji*, 2nd edn (*Neonatology*, 2nd edn) (Dağoğlu T & Ovalı F eds). Nobel Matbaacılık, İstanbul, pp. 163–174 [in Turkish].
- Savaşer S (2007) Bebeklerde deri ve cilt bakımı (Skin care on infants). *Klinik Çocuk Forumu* **7**, 51–60 [in Turkish].
- Scheinfeld N (2005) Diaper dermatitis. *American Journal of Clinical Dermatology* **6**, 273–281.
- Shin H (2005) Diaper dermatitis that does not quit. *Dermatologic Therapy* **18**, 124–135.
- Visscher MO & Hoath SB (2006) Diaper dermatitis. In *Irritant Dermatitis* (Chew AL & Maibach HI eds). Springer, London, pp. 37–51.
- Ward DB, Fleischer AB, Feldman SR & Krowchuk DP (2000) Characterisation of diaper dermatitis in the United States. *Archives of Pediatrics and Adolescent Medicine* **154**, 943–946.
- Wolf R, Wolf D, Tüzün B & Tüzün Y (2001) Diaper dermatitis. *Clinics in Dermatology* **18**, 657–660.

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