

Infant behaviour and maternal adaptation after uninterrupted skin-to-skin contact for 1 hour following birth in northern Uganda

Kristin Svensson^{1,2}

Scovia Mbalinda³

Eva Nissen^{1,3}

Beatrice Mpora
Odongkara⁴

Peter Waiswa⁵

Anna Hjelmstedt¹

Author details can be found
at the end of this article

Correspondence to:
Anna Hjelmstedt; anna.
hjelmstedt@ki.se

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Abstract

Background/Aims Uninterrupted skin-to-skin contact in the first hour after birth increases the chance of exclusive breastfeeding, a practice which improves health outcomes for both mothers and neonates. This study aimed to compare mother–infant pairs who had or did not have skin-to-skin contact 1 hour after birth and investigate infant behaviour and maternal adaptation as a result.

Methods This study investigated the impact of skin-to-skin contact on a number of health indicators after birth of both mother and child. Two groups were included: 51 mother–infant pairs with skin-to-skin contact and 152 with no skin-to-skin contact, who were observed for 1 hour after birth. Mothers were interviewed at discharge and at 14 weeks postpartum about their sociodemographic background, ability to interpret their infant's signals and interaction with the infant, their own health and their infant's health and feeding. The Student's *t*-test and Chi squared test were used to assess the associations between the groups and sociodemographic characteristics. The Cramer's V test was used to assess the effect size for variable latch on. Factor analysis was conducted on statements from interviews on mothers' feelings regarding motherhood.

Results More infants latched on in the skin-to-skin contact group and the first breastfeeding was more often directed by the infants, compared to the no skin-to-skin contact group. Mothers in the skin-to-skin contact group were less likely to need help to breastfeed and tended to be more confident that they could provide sufficient milk for their child. They were also more likely to breastfeed longer and took no initiative to supplement the infant during the hospital stay, while mothers in the non-skin-to-skin contact group did so. More mothers in the skin-to-skin contact group believed that their infant could comfort itself.

Conclusions The results suggest benefits to uninterrupted skin-to-skin contact between mothers and newborns 1 hour after birth in regard to initiation of breastfeeding, intended time to breastfeed, maternal self-confidence and infant self-regulation. Interventions to promote skin-to-skin contact should be implemented in this setting.

Key words: Breastfeeding; Breastfeeding self-efficacy; Feelings about motherhood; Infant interaction; Interpretation of infant cues; Skin-to-skin contact

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Introduction

The World Health Organization (WHO) and United Nation Children's Fund (UNICEF) recommend uninterrupted skin-to-skin contact for the first hour after birth for mothers and their newborns (WHO and UNICEF, 2018). If this contact is practiced, the chance of keeping the newborn's blood sugar level stable increases (Christensson et al, 1992) and the newborn's temperature will increase (Christensson et al, 1992; Puig and Sguassero, 2007; Mori et al, 2010; Nissen et al, 2019). Newborns who have skin-to-skin contact with their mother cry less than those who do not (Christensson et al, 1992). Skin-to-skin contact for 25–120 minutes after birth has a positive impact on bonding and interactions between the mother and her infant even 1 year later (Bystrova et al, 2009). Moreover, this contact has an effect on the mother's sensitivity in her behaviour towards her newborn during

breastfeeding (Dumas et al, 2013). Another important effect of skin-to-skin contact is that it results in a faster expulsion of the placenta and reduces the risk for large postpartum haemorrhage (Essa and Ismail, 2015).

During the first hour after birth, when the infant has skin-to-skin with their mother, the newborn develops an inborn sequence of behaviours that result in early initiation of breastfeeding (Widström et al, 2011; Moore et al, 2016). Skin-to-skin contact also leads to a longer duration of breastfeeding (Bystrova et al, 2007; Puig and Sguassero, 2007; Nagai et al, 2011) and increases the mother's self-esteem in relation to breastfeeding (Aghdas et al, 2014).

Once breastfeeding is established, there are a host of positive and well-documented health outcomes for both mothers and their infants (Victora et al, 2016), including decreased gastrointestinal infection in exclusively breastfed babies (Kramer et al, 2009). Both early initiation and exclusivity of breastfeeding have been linked to decreased neonatal mortality (NEOVITA Study Group, 2016). It also reduces healthcare costs and has no negative effect on the environment, in comparison with bottle feeding (Rollins et al, 2016).

WHO recommends 6 months of exclusive breastfeeding (WHO, 2017). In Uganda, the proportion of infants who are exclusively breastfed at 1 month is as low as 57% (Waiswa et al, 2010) and 7% and 0% by 3 and 6 months, respectively (Engebretsen et al, 2007). It is therefore of utmost importance to increase exclusive breastfeeding in Uganda and thereby improve the health of both mother and infant and reduce neonatal mortality.

Following an intervention to promote skin-to-skin contact in a hospital in northern Uganda, the authors found an increase of uninterrupted skin-to-skin contact from 0% to 54% of infants in Gulu Hospital 2 months after the intervention was implemented, and that these infants had better thermoregulation than infants exposed to the normal routine (Nissen et al, 2019). To the authors' knowledge, further aspects of skin-to-skin contact have not been studied in the Ugandan setting, specifically the effects of this contact on initiation of breastfeeding, infant behaviour, and maternal adaptation in primiparous Ugandan women.

The aim of the study was to compare mother–infant pairs who had uninterrupted skin-to-skin contact 1 hour after birth or did not have this contact and investigate:

1. Infant behaviour during the first hour
2. Feeding at discharge from hospital and at 14 weeks postpartum
3. Breastfeeding self-efficacy
4. Feelings about motherhood, including interpretation of and interaction with the infant, at 14 weeks postpartum.

Methods

Study setting

The research was conducted at Gulu Hospital, a governmental regional referral hospital in northern Uganda with an annual birth rate of approximately 3000 deliveries, according to a review of the hospital's records from 2018 (data on file, 2018). The routine care of newborns was to allow them a few minutes of skin-to-skin with the mother while cutting the cord and drying the newborn infants. Then they were wrapped in blankets and put on a table beside the resuscitation table. The intervention included the following steps:

- To gain support from the hospital management to conduct the project aiming at implementing skin-to-skin contact
 - To show the DVD 'Skin to skin in the first hour after birth: Practical advice after vaginal and caesarean birth' (Brimdyr et al, 2011) to the staff, who were also informed in a lecture about the health benefits of skin-to-skin contact and breastfeeding
 - To distribute pamphlets produced for this project among the health professionals, with details about how to practice skin-to-skin contact
 - To hang a poster describing the newborn's nine stages to start breastfeeding in the first hour after birth (Widström et al, 2011) on the walls of the maternal unit
 - To conduct focus group interviews and individual interviews with the staff to explore what they perceived as hindering and facilitating factors to practicing skin-to-skin contact
 - To distribute 'ambassador cards' to those who participated in the interviews.
- Details of the intervention have been described previously (Mbalinda et al, 2018).

Participants

The participants included two samples of mother–infant pairs. The first sample was observed before and the second sample after the intervention. Primiparous women in active labour who were admitted to the delivery ward at the hospital were informed orally and in writing about the project by a research assistant. They were informed that participation was voluntary and that they could withdraw from the study at any time without negative effects on the overall care they would receive. Those who agreed to participate signed an informed consent form.

Inclusion criteria were women with a full-term normal pregnancy, planned vaginal delivery and one live fetus, where the birth was anticipated to be uncomplicated and the infant healthy. The participants that were included had a normal delivery with no need to resuscitate the infant. Exclusion criteria were separation of the mother and the infant for medical reasons.

A total of 110 mother–infant pairs were observed before the intervention and 93 mother–infant pairs were observed after it. Details of the recruitment of participants has been described previously (Nissen et al, 2019). Of those 203 mother–infant pairs, 51 had uninterrupted skin-to-skin contact for 1 hour after birth and 152 did not have uninterrupted skin-to-skin contact for 1 hour after birth.

Data collection

A protocol was developed by the authors to observe maternal and newborn behaviour during 1 hour after birth. These behaviours include breastfeeding initiation (touching areola and licking nipple and areola), latching and interaction between the mother and infant. The participants were interviewed about their socioeconomic conditions and their health, feeding and infant health. The questions were developed by the research team, including experts in breastfeeding. Information about maternal health was retrieved from medical records. The mothers were planned to be interviewed before discharge from the hospital but 11 mothers had left the hospital before the scheduled interview or there was no research assistant on duty. Thus, data at discharge was collected for 50 mothers in the skin-to-skin contact group and for 142 mothers in the non skin-to-skin contact group.

The participants were interviewed about their socioeconomic status using questions from the Ugandan Wealth Index (The Demographic and Health Surveys Program, 2020). They were also interviewed about their and their infant's health and feeding, including intended time to breastfeed and possible supplementation. The questions were developed by the research team, including midwives and paediatricians. The responses were both predefined and open-ended. For example, if the mother answered that she had been ill, she was asked to specify in what way. Information about maternal health was retrieved from medical records.

At 14 weeks postpartum, the participants were interviewed about their own and their infant's health and feeding. The questions were developed by the authors. This was planned to be conducted when the mothers came back to the hospital with their babies for immunization, but some of the mothers did not come to the scheduled visit. Of those, some were approached in their homes or a telephone interview was performed. However, seven mothers in the skin-to-skin contact group and 69 mothers in the non skin-to-skin contact group were unreachable, for various reasons such as wrong telephone number or wrong address. Thus, at 14 weeks postpartum the sample consisted of 44 mothers in the skin-to-skin contact group and 83 mothers in the non skin-to-skin contact group.

The breastfeeding self-efficacy scale was used to measure maternal breastfeeding confidence (Aghdas et al, 2014), which is based on Bandura's self-efficacy theory (Bandura, 1977) and was originally developed by Dennis and Faux (1999). The scale used consisted of five items with answers on a 4-point Likert-type scale with 1=Strongly agree and 4=Strongly disagree. To investigate mothers' feelings about motherhood, verified items were used (Ekström and Nissen, 2006). The items were adapted to the Ugandan context, and additional items were included. They were answered on a 4-point Likert scale where 1=Strongly agree and 4=Strongly disagree. The participants were also asked about their ability to interpret their infant's signals and interaction with the infant. The questions were developed by the authors and were 13 'yes' or 'no' response questions.

To validate the scale, it was tested on master's students in midwifery at Makerere University, Uganda. They suggested some wording adjustments, which were included. As the data are based on direct observation, there is no recall bias in the point-in-time for first breastfeeding.

The data were collected by trained research assistants. A description of their training has been presented previously (Nissen et al, 2019). All original questionnaires were in English but were translated into Acholi by an authorised translator (Makerere University, Department of Languages, Uganda). The authors additionally sat with the research assistants fluent in Luo to correct the Acholi language into culturally appropriate statements. Since some mothers were expected to be illiterate, it was decided that the research assistants should fill in the questionnaires. The research assistants carefully explained the meaning of different response alternatives.

Some of the instruments used in this study have been previously validated, such as the breastfeeding self-efficacy scale (Dennis, 2003). For this study, the version by Aghdas et al (2014) was modified and used. The statements used to capture maternal feelings have been used in different settings and shapes (Ekström and Nissen, 2006; Carlander et al, 2010). The questionnaires were tested for content validity among Ugandan master students and an expert panel who found the statements valid and adequate for the Ugandan setting.

Ethical approval

The project was approved by The Institutional Review Board of Makerere University (SHREC REF 213–051), the Ugandan National Council of Science and Technology (ADM 154/212/01) and the Central Ethical Review Board in Stockholm (2013/1732–31/4).

Data analysis

As descriptive measures, the mean and standard deviation were calculated for data on an interval scale level and cross tables were used to describe data on a nominal level. For testing of hypotheses on an interval scale level, the Student's *t*-test for independent samples was used, and for data on a nominal level, Chi squared analyses were conducted. Where expected values were lower than 5, the Fisher's exact test was used instead. To assess effect size, Cramer's V was calculated for latch on. To reduce the number of tests, a principal component factor analysis was conducted for the eight statements about 'mother's feelings about her motherhood'. Factors with eigenvalues >1 and factor loadings > 0.4 were extracted. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0,656, $P < 0,01$. *P* values <0.05 were considered as significant.

Results

Sociodemographic characteristics

The sociodemographic characteristics of the participants are shown in **Table 1**. The mean age of the women in the skin-to-skin contact group was 20 years (standard deviation 2.83) and 20 years (standard deviation 2.62) in the non skin-to-skin contact group. Most (contact group: 81.2%; non-contact group: 87.5%) mothers had primary or secondary education, but two mothers in the skin-to-skin contact group had no education at all. Most mothers in both groups were housewives (contact: 60.4%; non-contact: 61.9%), married or co-habiting (contact: 87.6%; non-contact: 86.3%) and Christian (contact: 91.7%; non-contact: 92.1%). About a third (contact: 21.3%; non-contact: 34.5%) in both groups had ducks and/or chickens in their household. Only one participant did not have access to a toilet facility. Less than a third in both groups (contact: 25.0%; non-contact: 28.8%) had tap water. The majority of the participants in both groups (contact: 60.4%; non-contact: 64.5%) had a natural floor material such as soil and grass thatched roofs.

Medical and obstetric background

A total of 4% of the mothers in the skin-to-skin contact group and 6% in the non skin-to-skin contact group had HIV. None of the women in either of the groups were induced or had been given oxytocin for augmentation of labour. All women except two in the non skin-to-skin contact group had been given oxytocin intramuscularly postpartum.

Table 1. Sociodemographic characteristics

	Skin-to-skin contact <i>n</i>=50	Non skin-to-skin contact <i>n</i>=142
	<i>n</i> (%)	<i>n</i> (%)
Education		
Primary	22 (44.0)	64 (45.0)
Secondary	17 (34.0)	55 (38.7)
Tertiary	9 (18.0)	17 (11.9)
No education	0 (0)	2 (1.4)
Missing	2 (4.0)	4 (2.8)
Work		
Housewife	29 (58.0)	86 (60.5)
Self-employed/employed	9 (18.0)	31 (21.8)
Other/no work/student	10 (20.0)	22 (15.4)
Missing	2 (4.0)	3 (2.1)
Marital status		
Married/co-habiting	42 (84.0)	120 (84.5)
Single	6 (12.5)	18 (12.6)
Other	0 (0)	1 (0.7)
Missing	2 (4.0)	3 (2.1)
Religion		
Christian	44 (88.0)	128 (90.1)
Muslim	3 (6.0)	2 (1.4)
Born again/other	1 (2.0)	9 (6.3)
Missing	2 (4.0)	3 (2.1)
Ducks and/or chicken in household		
Yes	15 (30.0)	48 (33.8)
No	32 (64.0)	91 (64.2)
Missing	3 (6.0)	3 (2.1)
Goat and/or sheep and/or cattle in household		
Yes	13 (26.0)	30 (21.6)
No	35 (70.0)	109 (76.7)
Missing	2 (4.0)	3 (2.1)
Toilet facilities		
Flush toilet	3 (6.0)	4 (2.9)
Latrine	45 (90.0)	134 (94.3)
No facility/bush/field	0 (0)	1 (0.7)
Missing	2 (4.0)	3 (2.1)

Table 1. Sociodemographic characteristics (continued)

Main source of drinking water		
Bore hole	19 (38.0)	72 (50.7)
Tap water	12 (24.0)	40 (28.1)
Well/spring	17 (34.0)	26 (18.3)
Other	0 (0)	1 (0.7)
Missing	2 (4.0)	3 (2.1)
Floor material		
Natural (soil/sand/dung/wood/bamboo)	29 (58.0)	89 (62.6)
Finished (e.g. polished wood, vinyl, cement)	19 (38.0)	49 (34.5)
Missing	2 (4.0)	3 (2.1)
Roof material		
Thatch/grass/leaves	26 (52.0)	89 (62.6)
Iron sheets/tiles	22 (44.0)	49 (34.5)
Missing	2 (4.0)	3 (2.1)

Infant background

There were no significant differences between the groups in proportion of infant gender (contact: 54.9% girls; non-contact: 53.9% girls), infant birth weight (contact: mean=2.98 kg, SD=0.46 kg; non-contact: mean=3.04 kg, SD=0.50 kg) or infant birth length (contact: mean=49.38 cm, SD=0.78 cm; non-contact: mean=49.34 cm, SD=1.50 cm). In the skin-to-skin contact group, one infant had a breathing problem and one had sepsis, whereas no infants in the non-contact group were reported to be ill.

Maternal and infant behaviour during the first hour

The maternal and infant behaviour observed are presented in Table 2.

A larger proportion of the mothers in the skin-to-skin contact group (98%) looked at their infant than in the non skin-to-skin contact group (79.6%). There was a significant association between the skin-to-skin contact group and correct breastfeeding positioning (placed with the infant's chest to the mother's chest with the mouth above the nipple), infant touching the areola with their hands and licking the areola and nipple ($P<0.001$ for all).

In the skin-to-skin contact group, 33.4% of the infants latched on during the first hour after the birth, while only 2.8% of the infants in the non skin-to-skin contact group latched on ($P<0.001$, effect size Cramer's $V=0.808$, $P<0.001$). Of the 19 total infants who latched on during the first hour after birth (15 in contact group, 4 in non-contact group), the initiative was taken by the infant without being helped in 14 (93.3%) of the infants in the skin-to-skin contact group compared with only 2 (50%) in the non skin-to-skin contact group. In the skin-to-skin contact group, one of the infants was helped by staff and in the non skin-to-skin contact group, two were helped by the mother (Chi squared=8.471, df=2, $P=0.014$).

Feeding at discharge

All but one mother in the study (who was in the non skin-to-skin contact group) breastfed at discharge. Of the mothers in the skin-to-skin contact group, 84% breastfed exclusively at discharge, and 89% in the non skin-to-skin contact group breastfed exclusively. The infants who were partly breastfed (contact group: 12%; non-contact group: 8.5%) were

Table 2. Maternal and infant behaviour during the first hour

	Skin-to-skin contact, n=51 (%)	Non skin-to-skin contact, n=152 (%)	Chi squared	df	P value
Mother looks at infant	49 (98.0)	113 (79.6)	11.943	2	0.003
Correct position	28 (56.0)	12 (8.5)	50.69	2	<0.001
Infant touches the areola with hands	49 (98.0)	113 (79.6)	11.943	2	0.003
Infant licks the areola and nipple	14 (28.0)	3 (2.1)	31.620	2	<0.001
Number of infants latching	15 (30.6)	4 (3.3)	26.695	2	<0.001

*Infant is placed with the infant's belly to mother's belly with infant's mouth above the nipple.

given water as a supplement. Data were missing for 4% of the mothers in the skin-to-skin contact group and for 2% of the mothers in the non skin-to-skin contact group. The reasons for this are covered in the discussion.

None of the mothers in the skin-to-skin contact group supplemented breastfeeding for their infants, whereas 12.7% of the mothers in the non skin-to-skin contact group did (Fisher's exact test, $P=0.015$). The initiative to give supplementation came either from the mother herself, grandmothers, mothers-in-law or sisters-in-law, according to interview responses. The intended time to breastfeed was 26 months in both groups at discharge.

Mothers' and infants' health at 14 weeks postpartum

The majority of the interviews were performed at 14 weeks postpartum (contact group: mean=14.86 weeks, standard deviation=1.25; non-contact group: mean=14.63 weeks, standard deviation=2.26). Among the mothers in the skin-to-skin contact group, 36% had

Table 3. Infant's health at 14 weeks postpartum, as assessed by mother

	Skin-to-skin contact, n=44 (%)	Non skin-to-skin contact, n=83 (%)	P value
No illness	12 (27.2)	44 (53.0)	0.005*
Missing	2 (4.5)	4 (4.8)	
Gained weight as expected	35 (79.0)	64 (77.1)	0.753*
Missing	2 (4.5)	4 (4.8)	
Developed physically as expected	40 (90.9)	79 (95.2)	0.447*
Missing	2 (4.5)	4 (4.8)	
Slept well	40 (90.9)	76 (91.6)	1.000*
Missing	2 (4.5)	4 (4.8)	
No colic/abdominal pain	23 (52.3)	40 (48.2)	0.662
Missing	2 (4.5)	4 (4.8)	

* Fisher's exact test

been ill and 28% had been ill in the non-contact group. Mothers reported that malaria was the most common disease experienced over the first 14 weeks.

The infants' health at 14 weeks postpartum, as assessed by their mother, is presented in **Table 3**. Fewer infants in the non-contact group had been ill compared to the infants in the contact group ($P=0.005$). Mothers reported the most common illnesses were flu, cough and malaria. The majority of the infants in both groups had gained weight (contact: 80%, non-contact: 77%), developed physically as expected (contact: 91%, non-contact: 95%) and slept well (contact: 91%, non-contact: 92%).

Feeding at 14 weeks postpartum

At 14 weeks postpartum, 47.7% and 42.2% breastfed exclusively in the skin-to-skin contact and non skin-to-skin contact groups, respectively. The mothers who partly breastfed were divided into two groups, those who had given only water, glucose or/and tea (predominantly breastfeeding) and those who had given porridge, cow's milk, soup, beans or formula (some breastfeeding). There were no statistically significant differences between the groups (Chi squared=0.823, df=2, $P=0.633$).

Table 4. Participants' responses on breastfeeding self-efficacy scale

	Skin-to-skin contact group n=44 (%)	Non skin-to-skin contact group n=83 (%)	P value
I have the necessary skills to breastfeed			0.256
Strongly agree/agree	37 (83.7)	74 (89.0)	
Disagree/strongly disagree	7 (16.3)	9 (11.0)	
Missing	0 (0)	0 (0)	
I know how to breastfeed			
Strongly agree/agree	41 (93.0)	75 (90.2)	
Disagree/strongly disagree	3 (7.0)	8 (9.8)	
Missing	0 (0)	0 (0)	
I won't need help to breastfeed			0.047
Strongly agree/agree	23 (51.2)	27 (32.9)	
Disagree/strongly disagree	21 (48.8)	56 (67.1)	
Missing	0 (0)	0 (0)	
Breastfeeding is easy			0.656
Strongly agree/agree	34 (76.7)	56 (67.1)	
Disagree/strongly disagree	10 (23.3)	27 (32.9)	
Missing	0 (0)	0 (0)	
I am confident I can breastfeed			0.999
Strongly agree/agree	43 (97.7)	81 (97.6)	
Disagree/strongly disagree	1 (2.3)	2 (2.4)	
Missing	0 (0)	0 (0)	
I know I have enough milk for the baby			0.063
Strongly agree/agree	37 (83.7)	57 (68.3)	
Disagree/strongly disagree	7 (16.3)	26 (31.7)	
Missing	0 (0)	0 (0)	

In the contact group, only the mother fed the infant, whereas in the non-contact group, 18.9% of the infants were fed by others ($P=0.007$). Others could be the grandmother, mother-in-law, sister, sister-in-law, co-wife or friend. One of the mothers reported that the father of the infant fed the baby. Information is missing in 22.7% of the mothers in the contact group and in 9.6% of the mothers in the non-contact group.

At this point (14 weeks postpartum), mothers in the contact group now reported that they intended to breastfeed for 24 months and mothers in the non-contact group now reported that they intended to breastfeed for 22 months ($P=0.047$).

Breastfeeding self-efficacy scale

The results from the breastfeeding self-efficacy scale questions are presented in Table 4. There were no differences in the means of the breastfeeding self-efficacy score between the groups (contact group: 12.12, standard deviation: 1.97); non-contact group: 12.60, standard deviation: 2.18). When the response alternatives were collapsed into two groups (strongly agree/agree and disagree/strongly disagree), a few differences were found on single items. The mothers in the skin-to-skin contact group reported less often that it was difficult to breastfeed ($P=0.047$). Mothers in the skin-to-skin contact group were less worried about their milk production than mothers in the non skin-to-skin contact group ($P=0.063$), although this difference was not significant.

Table 5. Factor analysis of mother's feelings about motherhood (n=124)

Item	Factor loading
Factor 1. Easiness with the infant	
I think my baby is happier than other babies	0.711
I am happy to be a mum	0.687
It is easy to care for my baby	0.678
I enjoy feeding my baby	0.675
Factor 2. Lack of confidence	
I think other people take better care of my baby than I do	0.803
I think my baby cries more than other babies	0.471
Factor 3. Difficulties caring for the infant	
It is difficult to be a mum	0.780
I think it is difficult to care for my baby	0.729

Table 6. Mothers' feelings about motherhood and association with group

	Skin-to-skin contact group (n=44)		Non skin-to-skin contact group (n=83)		
	Mean	SD	Mean	SD	P value
Easiness with the infant*	7.3409	1.53930	7.7195	1.65010	0.211
Lack of confidence†	6.3023	0.91378	6.2805	0.99721	0.905
Difficulties caring for the infant‡	5.0227	0.87574	5.0000	1.15822	0.909

*Maximum score: 16, high score indicates difficulty with infant

†Maximum score: 8, high score indicates strong confidence

‡Maximum score: 8, high score indicates greater difficulty

Table 7. Mothers' interpretation of and interaction with their infant

	Skin-to-skin contact group n=44 (%)	Non skin-to-skin contact group n=83 (%)	P
Could you tell me when your baby is hungry?			0.299
Yes	44 (100)	81 (97.6)	
No	0 (0)	2 (2.4)	
Could you tell me if you understand when the baby needs to sleep?			0.961
Yes	43 (97.7)	81 (97.7)	
No	1 (2.3)	2 (2.4)	
Could you tell me when your baby needs to pass stool?			0.461
Yes	41 (93.2)	74 (89.2)	
No	3 (6.8)	9 (10.8)	
Does your baby smile?			*
Yes	44 (100)	83 (100)	
No	0 (0)	0 (0)	
Do you talk with your baby?			0.680
Yes	43 (97.7)	80 (96.4)	
No	1 (2.3)	3 (3.6)	
Do you cuddle your baby?			0.238
Yes	42 (95.5)	82 (98.8)	
No	2 (4.5)	1 (1.2)	
Do you sing for your baby?			0.075
Yes	32 (72.7)	47 (56.6)	
No	12 (27.3)	36 (43.4)	
Can your baby sooth (comfort) itself?			0.022
Yes	33 (75.0)	45 (54.2)	
No	11 (25.0)	38 (45.8)	
Do you think your baby is calmer than other babies at the same age?			0.758
Yes	21 (47.7)	42 (50.6)	
No	23 (52.3)	41 (49.4)	
Do you play with your baby?			0.299
Yes	44 (100)	81 (97.6)	
No	0 (0)	2 (2.4)	
Does your baby imitate your facial expression?			0.258
Yes	23 (52.3)	52 (62.7)	
No	21 (47.7)	31 (37.3)	

*All mothers in both groups had seen their baby smile

Mothers' feelings about motherhood

Three factors were extracted from the items regarding mothers' feelings about motherhood. The first factor, 'easiness with the infant', describes easiness and happiness of caring for the infant

and to be a mother. The second factor, 'lack of confidence', reflects a lack of self-confidence in regard to the relationship with the infant. The third factor, 'difficulties caring for the infant', is related to difficulties with the mother role and infant care. The three factors explained 29.05%, 16.84% and 14.16% of item variance, respectively (totally 60.06%) of the principal component factor analysis. Further details are presented in **Table 5**. There were no differences in means between the groups in any of the factors, based on the Student's *t*-test (**Table 6**).

Mothers' interpretation of and interaction with their infant

The participants' interpretations of interactions with their infant are displayed in **Table 7**. Almost all mothers in both groups understood when her baby was hungry (contact group: 100%; non-contact group: 97.6%), needed to sleep (contact group: 97.7%; non-contact group: 97.7%) and needed to pass stool (contact group: 93.2%; non-contact group: 89.2%). Most mothers talked to (contact group: 97.7%; non-contact group: 96.4%), played with (contact group: 100%; non-contact group: 97.6%) and cuddled (contact group: 95.5%; non-contact group: 98.8%) their babies. About half of the mothers in the non skin-to-skin contact group thought that their infant was calmer than other infants and that the infant could imitate her facial expression (50.6% and 62.7%, respectively), which was similar to the skin-to-skin contact group (47.7% and 52.3%, respectively). More mothers in the skin-to-skin contact group (76.7%) believed that their infant could comfort itself compared to 55.7% in the non skin-to-skin contact group, and this was the only statistically significant difference between the groups ($P=0.022$).

Discussion

This study evaluated an intervention to promote uninterrupted skin-to-skin contact between mothers and newborns 1 hour after birth. It was found that more infants with contact latched on and the first breastfeeding was more often directed by the infants during skin-to-skin contact compared to infants without this contact. Mothers in the skin-to-skin contact group were less likely to report that they needed help to breastfeed and they tended to be more confident with their milk production. The intended time to breastfeed was longer in mothers in the skin-to-skin contact group compared to mothers in the non skin-to-skin contact group at the 14-week postpartum interview. Taken together, these findings indicate more confidence in breastfeeding in mothers in the skin-to-skin contact group than in the non skin-to-skin contact group, which is in line with the findings of Aghdas et al (2014). Most mothers reported that their interaction with their infant was adequate. However, more mothers in the skin-to-skin contact group believed that their infant could comfort itself than the mothers in the non skin-to-skin contact group. This suggests a higher confidence in the infant's capacity to self-regulate at 14 weeks' age. Bystrova et al (2009) has shown that infants who have had skin-to-skin contact had better self-regulation capacity at 12 months'. Whether the infants in the present study actually had better self-regulation was not reported.

In the present study, only six (11.6%) infants in the skin-to-skin contact group compared with two (1.3%) infants in the non skin-to-skin contact group started breastfeeding within 1 hour. In the skin-to-skin contact group, 30.6% latched compared to 3.3% in the non skin-to-skin contact group, but in most cases no appropriate breastfeeding was observed; although infants began to latch, suckling was weak and no rhythmic suckling occurred (Kumar et al, 2006). This contrasts with the findings of Mukunya et al (2017) who found that 51.8% breastfed within 1 hour, based on maternal recall up to 2 years after childbirth, and the Uganda Demographic and Health Survey of 2016, where it was shown that in the Acholi region, 57.2% were breastfed within 1 hour of birth, based on self-reported data collected up to 2 years after the birth (Uganda Bureau of Statistics and IHF, 2018). These data may carry a recall bias, since data was collected later and by self-report. It has been reported in other studies that it takes at least 1 hour for newborn infants in skin-to-skin contact to locate the nipple and start suckling (Widström et al, 1987; 2011). During this hour, the infant gets acquainted with the mother (Widström et al, 2019) and prepares the mother to produce milk (Matthiesen et al, 2001). In another study by the same group, it was found that

Key points

- Uninterrupted skin-to-skin contact following birth allows the newborn to develop its feeding behaviour.
- Skin-to-skin contact 1 hour following birth results in early initiation of breastfeeding.
- Uninterrupted skin-to-skin contact improves maternal self-confidence and infant self-regulation when assessed at 14 weeks postpartum.
- Mothers who have had skin-to-skin contact for 1 hour are more likely to intend to breastfeed for a longer time at 14 weeks postpartum.

breastfeeding occurred around 70 minutes after birth in an unmedicated group of infants (Nissen et al, 1995), suggesting that infant-directed initiation of breastfeeding may take longer than 1 hour.

Overall, 47.7% of the infants in the skin-to-skin contact group were breastfed exclusively at 14 weeks and 42.2% were exclusively breastfed in the non skin-to-skin contact group. This is in line with Tylleskär et al (2011), who found that 44% of the mothers without contact breastfed exclusively at 12 weeks, whereas in their intervention group (who had low intensity individual breastfeeding peer counselling), the corresponding figure was 82% (Tylleskär et al, 2011). At 14 weeks, the women in the skin-to-skin contact group intended to breastfeed for longer than the women in the non skin-to-skin contact group and their intentions approached the breastfeeding figures shown in the 2016 Ugandan Demographic and Health Survey (Uganda Bureau of Statistics and ICF, 2018) for the Acholi sub-region, which were reported as exclusive breastfeeding for 5.1 months and any breastfeeding for 21.1 months.

There was a seasonal variation in temperature during data collection, which may explain the unexpected finding that infants in the skin-to-skin contact group were reported to have more illness during the first 14 weeks than the non skin-to-skin contact group, which consisted of infants who were born 3 months earlier, on average (Funk et al, 2012).

More than half of the infants in both groups had received nutrition other than breast milk at 14 weeks' age. This is not in accordance with WHO recommendations (WHO, 2017) and further studies on measures to promote longer exclusive breastfeeding should be conducted, such as the peer counselling study by Tylleskär et al (2011). Methods to reduce memory bias in the collection of breastfeeding data also needs to be developed.

Limitations

In this study there were some dropouts. The research assistants were not able to reach some mothers for an interview before discharge, as they had already left the hospital or the research assistants were not on duty and therefore background data are missing for some participants. At the 14 week assessment, some mothers were not found for various reasons, such as missing or inaccurate information on mobile number and address. Thus, the reasons for not participating in all parts of the study were the result of technical difficulties and not the participants' wish to refrain from the study. In this respect, the authors believe that the dropouts were not systematic and therefore might have less impact on the results. The low number of internal dropouts is probably because the research assistants helped the mothers to fill in the questionnaires. The reason behind this decision was that some of the mothers were expected to be illiterate.

Conclusions

The results suggest that interventions promoting uninterrupted skin-to-skin contact between mothers and newborns for at least 1 hour after birth should be implemented, as this improves initiation of breastfeeding, intended time to breastfeed, maternal self-confidence and infant self-regulation at 14 weeks postpartum, as assessed by the mother.

In future studies, observation of mother–infant interaction should be conducted to establish the effects of skin-to-skin contact. Observation can also form a basis for validation, adaptation and development of reliable scales for the Ugandan setting.

Author details

¹Department of Women's and Children's Health, Karolinska Institutet, Solna, Sweden

²Karolinska University Hospital, Stockholm, Sweden

³Department of Nursing, College of Health Science, Makerere University, Kampala, Uganda

⁴Department of Paediatrics and Child Health, Gulu University/Gulu Regional Referral and Teaching Hospital, Gulu, Uganda

⁵Health System Policy, Department of Public Health Sciences, Karolinska Institutet, Solna, Sweden

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Conflict of interest

None declared.

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