

# Use of Silicone Nipple Shields as a Lactation Aid for Flat or Inverted Nipples: An Observational Study in A Tertiary Care Hospital

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## ABSTRACT

**Introduction:** Breastfeeding is a natural phenomenon occurring after the birth of a baby. An estimated nine to ten percent of women present with flat, retracted or inverted nipples which can hinder with smooth establishment of breastfeeding. With this background we evaluated the use of silicone nipple shields for facilitating effective latching and successful breastfeeding in mothers who had latching problems due to flat or inverted nipples over the first 4 weeks postpartum.

**Material and Methods:** We conducted a prospective observational cohort study in the neonatal unit and post natal wards of a tertiary hospital. We identified 30 mothers-infant couplets, who delivered late preterm and term, and had feeding difficulties due to flat or inverted nipples. They received a soft silicone nipple shield to facilitate better latching of the infant to the breast and facilitate breastfeeding. We evaluated their ability to successfully breastfeed on day 28 postpartum with appropriate weight gain ( $\geq 400$  gm weight gain over 3rd and 4th week of life) by the infant on follow up.

**Results:** 80% mothers could successfully breastfeed after discharge with use of the nipple shield at the end of 28 days. 93% mothers had no pain or discomfort while using the nipple shield. The average weight gain of infants in our study group in the 3rd and 4th week of life was 420 ( $\pm 85.6$ ) gms.

**Conclusions:** Early identification of flat and inverted nipples and use of a simple device like the soft silicone nipple shield can help mothers establish early and successful breastfeeding.

**Keywords:** Breastfeeding, Flat Nipples, Inverted/ retracted Nipples, Lactation, Nipple shield

With this background, we undertook this observational study to evaluate the use of silicone nipple shields as a lactation aid for mothers with flat or inverted nipples whose babies were unable to latch at the breast despite lactation counselling so as to achieve successful breastfeeding.

## MATERIAL AND METHODS

This observational study was done in the neonatal unit and post natal wards of a tertiary care hospital from April 2014 to September 2014. Our aim was to evaluate the use of silicone nipple shields for facilitating effective latching and successful breastfeeding in mothers who had latching problems due to flat or inverted nipples over the first 4 weeks postpartum. Approval for conducting the study was obtained from the institution ethics committee.

During rounds, whenever mothers complained of feeding difficulties, they were evaluated for difficulty in positioning and latching the baby and counselling for the same was provided. Medical or obstetric complications hindering with breastfeeding were addressed. Babies with poor feeding skills were provided oromotor stimulation by the occupation therapist. Those mothers facing latching problems exclusively due to flat and inverted nipples were identified.

Flat/ inverted nipples were identified by doing a simple pinch test. The response to gentle compression of the areola was observed. If the nipple did not protrude it was considered flat. If the nipple would invert/ retract, it was considered inverted. The severity of the inverted nipples was graded by the degree of inversion as described by Han and Hong.<sup>8</sup>

Mothers with flat or inverted nipples were counselled and assisted in optimizing positioning and latching, taught Hoffman's technique and encouraged to breastfeed their babies on demand.<sup>2</sup> If they were unable to latch the baby to the breast by 24 hours of lactation support, they were offered a silicone nipple shield as a lactation aid. Informed consent was obtained from all individual participants included in the study. They were provided a commercially available nipple shield made from soft silicone flexible rubber, anatomic shape, 13 mm nipple diameter and 0.5 mm thickness. The nipple shield was thoroughly washed

## INTRODUCTION

Breastfeeding is a natural phenomenon and generally happens smoothly. Almost all mothers can breastfeed, provided they have accurate information along with the support of their family, the health care system and the society at large. The occurrence of inverted and flat nipples is a common problem hindering smooth establishment of breastfeeding. Approximately ten percent of women present with non-protractile nipples which may be flat, retracted or inverted.<sup>1</sup> The Hoffman's technique<sup>2</sup> and several commercially available products like breast shells<sup>3</sup>, Latch Assist<sup>TM</sup> nipple everter, Niplette<sup>TM4</sup> or even latex rubber bands cut from condom rims<sup>5</sup> have been tried to ameliorate this condition. Kesaree et al. found that using an inverted 10 or 20 ml disposable syringe to pull out the nipple prior to feeding helped seven out of eight women successfully latch their infants by 1 week of age. But there are practical problems when this technique is used as it takes several days for the nipple to become protractile and the baby may not be able to latch to the breast immediately.<sup>6</sup> Julie Bouchet-Horwitz reported that small silicone cups called supple cups used in the antepartum period improve nipple protractility and facilitate nipple eversion, but babies may still need nipple shields to latch effectively.<sup>7</sup>

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with soap and water and sterilised by boiling it in water for 10 minutes and allowing it to dry.

The mothers were taught the correct technique of applying the nipple shield by turning the shield inside out about half way and placing it over the nipple, then placing back the flange of the nipple shield over the areola with the tip of the shield drawn out. Mothers were instructed to moisten the inside of the nipple shield with breastmilk to help seal it into position and to ensure that the nipple was inside the tip of the shield. They were taught to gently stroke the baby's lips with the nipple shield and wait for the baby's mouth to be open as wide as possible, and then get the baby to attach to the breast. They were also counselled to allow the baby to feed ad libitum. Mothers were also informed that hand expression of some breastmilk to fill the nipple shield could also be tried to help the baby get started.

Mothers and babies were evaluated daily for achievement of a successful latch, baby's ability to feed from the breast with or without the shield, pain while using the shield and daily weight, till discharge. If the baby was unable to latch despite using the nipple shield or if baby showed  $\geq 3\%$  weight loss over the previous 24 hours, mothers were advised to feed the baby expressed breast milk with katori spoon ad lib. In case of inability to express enough volume of their own milk, the feeds were supplemented with pasteurized donor human milk. They were instructed to report pain during use of the shields on a Likert scale of 0 to 5, with '0' to '5' denoting no pain, discomfort, mild pain, moderate pain, severe pain and excruciating pain respectively. Additional help and counselling was provided whenever required while in hospital and on follow up. Mothers were instructed to follow-up on day 7 (if discharged earlier than day 7), day 14 and day 28 postpartum to evaluate the baby's ability to breastfeed, baby weight and any other problem. Exclusive breastfeeding was emphasised and encouraged at every contact.

### Primary outcome

The primary outcome studied was the ability of the baby to latch satisfactorily and breastfeed successfully by day 28. We defined successful breastfeeding as exclusive breastfeeding on day 28 directly from the breast with or without use of the nipple shield, without the need for supplemented feeds with a katori spoon and appropriate weight gain ( $\geq 400$  gm weight gain over 3rd and 4th week of life) by the baby on follow up.

### Secondary outcomes

Secondary outcomes studied were nipple pain and severity of pain experienced during use of the nipple shield, number of days of nipple shield use (during the follow up period of 28 days), need for supplementary feeds with top milk, duration of hospital stay related to feeding issues.

## STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. Descriptive statistics like mean and percentages were used for the interpretation of data.

## RESULTS

Out of the 5164 mothers who delivered during the study period, 4598 delivered term and late preterm babies. During rounds, 346 mothers complained of feeding difficulties. 47 mothers had problems getting their babies to latch on exclusively because

of flat or inverted nipples. Of these, 30 mothers were unable to breastfeed as the baby could not latch effectively despite assistance with the positioning and latching technique, lactation counselling or Hoffman's technique. None of the mothers had received any antenatal evaluation or counselling regarding their nipple problem. The baseline characteristics of these 30 mother-infant dyads were noted and are as shown in Table 1.

Mothers complained of feeding problems due to non-protractile nipples by 41 ( $\pm 35$ ) hours postpartum. The nipple shield was provided to them 24 hours thereafter i.e. at 65 ( $\pm 35$ ) hours. 29 of the 30 mother baby (96%) dyads could achieve a good latch immediately. It took 7.4 ( $\pm 16.8$ ) hours for the dyads to achieve breastfeeding directly from the breast, without any more supplementation with expressed milk/ donor human milk. All

Age of the mother at delivery (years)*	23 (3.2)
Education (class)*	7 (2.4)
No. of mothers having a vaginal delivery, n(%)	16 (53)
No. of primigravidas, n(%)	27 (90)
No. of mothers with a unilateral flat nipple, n(%)	1 (3)
No. of mothers with bilateral flat nipples, n(%)	9 (30)
No. of mothers with a unilateral inverted nipple, n(%)	0
No. of mothers with bilateral inverted nipples, n(%)	20 (67)
Severity of nipple inversion: no. of mothers with -	
Grade I inversion, n (%)	6 (20)
Grade II inversion, n (%)	11 (36)
Grade III inversion, n (%)	3 (10)
Gestational age of baby (weeks)*	38.4 (1.2)
Birth weight (g)*	2678 (498)
Male gender, n(%)	18 (60)
Late preterm babies, n(%)	8 (27)
Full term babies, n(%)	22 (73)
No of breastfeeds tried, but baby unable to latch *	8 (10.5)
*Mean	
<b>Table-1: Baseline Characteristics of Mothers and Their Babies (n=30)</b>	

Age of the baby when nipple shield was provided (hours)*	65 (35)
Time to achieve exclusive breastfeeding directly from the breast after using nipple shield (Hours)*	7.4 (16.8)
Duration of hospital stay for the baby (days)*	3.9 (1.5)
Mothers successfully breastfeeding on discharge(%)	30(100)
Mothers successfully breastfeeding on D28 n(%)	24(80)
Mothers successfully breastfeeding on D28 without using Nipple shield	15(50)
Mothers using the nipple shield on D28, n(%)	9 (30)
Mothers unable to exclusively breastfeed,n(%)	3(10)
Lost to follow up, n(%)	3 (10)
Mean duration of use of nipple shield (days)*	17.1 (9.35)
Mothers experiencing pain during use of nipple shield, n(%)	2 (6%)
Weight on discharge (gms)*	2496 (469.7)
Weight on day 7 (gms)*	2471 (484.6)
Weight on day 14 (gms)*	2615 (518.8)
Weight on day 28 (gms)*	3036 (505.9)
Weight gain from day 14 to day 28 (gms)*	420 (85.6)
*: Mean (SD)	
<b>Table-2: Observations After the Mother Was Provided a Nipple Shield</b>	

mothers were exclusively breastfeeding their babies with nipple shields at discharge.

On follow up, 24(80%) mothers could successfully breastfeed by day 28. Of these, fifteen mothers (50%) perceived enough improvement in the protractility of the nipple and could stop use of the nipple shield by 17.1 ( $\pm$  9.35) days. 9 mothers required to use the nipple shield to successfully breastfeed till day 28 and beyond. This included 2 of the 3 mothers with grade III inverted nipples. Three mothers were unable to exclusively breastfeed their babies at the end of 28 days due to mastitis (the 3rd mother with Grade III inverted nipples), wound gape and low milk output respectively. They supplemented their breast milk with average 5 top feeds per day of cow's milk. The remaining three mother-infant dyads were lost to follow up.

Only 2 mothers (7%) complained of pain of moderate severity while feeding the baby with the nipple shield; both these mothers had already developed cracked nipples before the nipple shield could be used. The pain decreased as the cracked nipples healed and they used appropriate positioning and latching techniques along with the nipple shields. Baby weights on discharge, day 7, day 14 and day 28 in grams were 2496 ( $\pm$ 469.7), 2471 ( $\pm$ 484.6), 2615 ( $\pm$ 518.8) and 3036 ( $\pm$ 505.9). Weight gain in the 3rd and 4th week of life was 420 ( $\pm$ 85.6)gms.

## DISCUSSION

Flat and inverted nipples are a common but neglected problem hindering early initiation and sustenance of exclusive breastfeeding. Inability to latch on to the breast may lead to losing out on the crucial period for early initiation and establishment of successful breastfeeding and eventually often resorting to top feeding. In our study, the nipple shield was provided to the mothers by 65 ( $\pm$ 35) hours postpartum and all of them were exclusively breastfeeding at discharge. 93% mothers had no pain or discomfort while using the nipple shield. 80% of the mothers were successfully breastfeeding by 28 day with or without the nipple shield. 15 women (50%) experienced improvement in the protractility of the nipple and could stop use of the nipple shield by 17.1 ( $\pm$  9.35) days. The average weight gain of infants in our study group in the 3<sup>rd</sup> and 4<sup>th</sup> week of life was 420 ( $\pm$ 85.6) gms which conforms to WHO standards. None of the mothers in our study had received any antenatal evaluation or counselling regarding their nipple problem.

Our study has evaluated a low cost, effective means of achieving early latching on to the breast for mothers with flat and inverted nipples. While nipple shields cannot be used antepartum, other devices like supple cups, breast shells and Hoffman's exercises have been tried antenatally with variable results.<sup>3,7</sup> Appropriate ante and postnatal counselling along with post discharge support is crucial in establishing and sustaining exclusive breastfeeding as mothers with nipple problems are at greater risk of complications like mastitis and tend to easily resort to top feeding. First time mothers with flat/ inverted nipples are the most vulnerable; they need to be identified early and provided with adequate counselling, support and lactation aids to facilitate successful breastfeeding. Early identification of flat and inverted nipples and use of a simple device like the soft silicone nipple shield can help mothers establish early and successful breastfeeding.

The major limitation of our study was the small sample size

with a short follow up period of just 28 days. Further adherence or decline in exclusive breastfeeding beyond 28 days could not be assessed. Additionally, we have not compared the nipple shields with any other modality of treatment.

Powers and Tapia reported that 60% of mothers began nipple shield use on the first or second day after delivery and had a median duration of nipple shield use of 2 weeks, which was similar to the findings in our study.<sup>9</sup> In the study by Brigham, average age of infants when nipple shield was initiated was 6.1 days (range of 1–42 days) but the use of shields continued for as long as 26.7 days (range of 2 days–4.5 months) depending on the severity of the nipple problem.<sup>10</sup> Chertok reported a mean duration of 2.9 ( $\pm$  2.1) weeks for the nipple to become protractile.<sup>11</sup> We found a shorter mean duration of nipple shield use with improvement in protractility of the nipple at 17.1 ( $\pm$  9.35) days. The duration of use of the shield is decided by the primary indication for its use and may be prolonged despite improvement in the protractility since the baby gets habituated to feeding with the nipple shield.

Major subset of mothers in various studies have been primigravidas<sup>9,12</sup> similar to the observation in our study. However in all these studies, mothers used nipple shields not only for flat/ inverted nipples but also for engorgement, sore nipples, cracked nipples and weak infant suck. In a pilot study by Chertok, 18.7% complained of sore nipples during use of the shields.<sup>13</sup> 7% of the mothers in our study complained of moderate pain while feeding the baby with the nipple shields, however they had developed sore and cracked nipples before the nipple shield was provided and the pain reduced over the next week. In a study by Nicholson, it was observed that 95% of mothers who received a nipple shield were exclusively breastfeeding in the beginning, but only 55% could sustain exclusive BF by 3 months.<sup>14</sup> Our study has shown that the rate of exclusive breastfeeding by 28 days of life was 80%. This emphasizes the importance of having long-term follow up till 6 months to look at adherence and compliance.

## CONCLUSION

With the use of a simple low cost device like soft silicone nipple shield, mothers with flat/ inverted nipples can initiate breastfeeding early and sustain exclusive breastfeeding without compromising appropriate infant weight gain.

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