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Insertional pain and other IUD insertion-related rare events for breastfeeding and non-breastfeeding women – a decade's experience in developing countries

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Abstract

The possible effect of breastfeeding on intrauterine device (IUD) insertion events was investigated. Analysis included a total of 6493 women who enrolled in multicenter IUD clinical trials over a ten-year period. Findings indicate that breastfeeding exerts a protective effect on the incidence of moderate to severe insertional pain and reduces the need for cervical dilatation to facilitate insertion. The pain protection effect was most evident in breastfeeding women who were still in lactational amenorrhea. Subjects with amenorrhea, both breastfeeding and non-breastfeeding, had a significantly lower incidence of pain at IUD insertion than the corresponding menstruating subjects. This effect may be related to a higher secretion of beta-endorphin in the breastfeeding and lactational amenorrheic subjects.

Introduction

Breastfeeding provides health benefits to infants. It is a natural, convenient and cost-effective contraceptive method; and by lengthening the birth interval, it also provides health benefits to mothers [1]. The health benefits of breastfeeding are especially important in developing countries.

The duration of the contraceptive effect of breastfeeding is, however, variable. Accordingly, women who want an extended birth interval or no more children need to switch to another contraceptive method before ovulation resumes. The intrauterine device (IUD) is a good contraceptive choice for these women, particularly those who are not yet ready for a permanent and generally irreversible sterilization. The efficacy of IUDs is far superior to that of barrier methods and, unlike combination oral contraceptives (OCs), IUDs do not exert a systemic effect that adversely affects

lactation [2–4]. Equally important, studies have shown that breastfeeding during IUD use does not adversely affect the IUD's performance [5,6]. For women in developing countries, the fact that one insertion of an IUD can provide a considerably long-lasting contraceptive effect makes it a much more desirable contraceptive method than barriers or orals, which demand regular supply and compliance, and are generally more costly. In the most recent World Health Organization (WHO) report, the IUD was recommended as the best contraceptive method for lactating women [7].

Attention has recently been directed to the relationship between breastfeeding and IUD insertion-related problems. A frequently cited case-control study conducted on US data revealed a 10-times higher risk of IUD-associated uterine perforation for lactating women as opposed to non-lactating women [8]. Two recent case-control studies using an international data set, on the other hand, suggested a rather unexpected protective effect of breastfeeding on severe pain occurring at IUD insertion [9] and a reduction in the need for cervical dilatation to facilitate insertion [10]. Similar case-control analyses on this international data set did not delineate breastfeeding at IUD insertion as either a deleterious or beneficial factor for other IUD insertion-related events such as failed insertion [11], syncope and other vasovagal reactions [12], uterine perforation [13] and cervical laceration (Chi *et al.*, in preparation).

The relationship between breastfeeding and IUD insertion is programmatically important and needs clarification. Both breastfeeding and IUD use are prevalent in developing countries, and many breastfeeding women in these countries use IUDs. Women having characteristics leading to a smooth IUD insertion are an ideal group to encourage others to use this method, and, conversely, any distressing events experienced during insertion can directly affect the acceptability of a family planning program offering IUDs. The fall of the Singapore IUD Action Program following a rumor of a high incidence of uterine perforation is one unfortunate example [14]. With more than 80 million women worldwide using IUDs (60 million of them residing in China) [15], even rare IUD insertion-related events can be translated into a significant public health problem*.

Although the case-control analysis approach is generally the most useful method, and sometimes the only feasible one, for the delineation of risk factors for rare events, an important limitation is that complete elimination of bias cannot be assured [17]. Findings from this study approach usually need to be replicated by other case-control or prospective studies before they can be accepted. We believe the international IUD database developed by Family Health International (FHI) during the last ten years is sufficiently large to examine these rare events 'prospectively' and to determine if the results thereof generally agree with the findings of case-control studies.

*According to Irving Sivin, if the risk of pregnancy (also a rare event) can be reduced from five to two per 100 at two years of IUD use in the People's Republic of China, it could mean a reduction of about 600 000 unwanted pregnancies each year [16].

Methods and materials

The IUD data used in this analysis were collected from international multi-center clinical trials coordinated by FHI between 1977 and 1986. All participating centers used identical case record forms and similar protocols.

Our study population was defined as women who were:

1. Parous and whose last pregnancy was a vaginally delivered term live birth,
2. Users of a common IUD type (i.e., Loops and variants, Copper T, Cu-7 and Multiload devices) during the interval period (>42 days since last delivery), and
3. From centers where one of the above IUD types was inserted in at least 100 women during the study period, breastfeeding status at insertion was known for at least 75% of the acceptors, and at least 10% of these subjects were breastfeeding at IUD insertion.

Altogether 6493 women were included for study, 3450 of whom were not breastfeeding (NBF) and 3043 of whom were breastfeeding (BF, including partially breastfeeding, defined as breastfeeding with supplementary food) at the time of IUD insertion. Eighteen international centers were included, seven located in Asia, seven in Latin America and four in the Middle East.

In this analysis, the IUD types were pooled into three categories according to configuration, namely: Loops, T-shaped devices (including the Cu-7) and Multiloads, which are horseshoe-shaped devices. Our study population comprised the following number of women, grouped by type of IUD inserted:

<i>IUD type</i>	<i>Number of users</i>	
Loops		
I.I.D	904	
Photo-reduced*	316	
Tapered*	237	
I.I.C	134	
I.I.D with copper*	130	
Subtotal		1721
T-shaped devices		
TCu200	1616	
TCu380A	1362	
TCu380Ag	363	
Cu-7	106	
Subtotal		3447
Multiloads		
250	945	
375	380	
Subtotal		1325

* These experimental IUD types were developed by FHI and used for a short time only. They were of the same shape as the Lippes Loop and were included for study to increase the sample size.

IUD insertion-related events (the outcome variables) examined in this analysis included: moderate/severe insertional pain, cervical dilatation required to facilitate insertion, cervical laceration, syncope, insertion failure and uterine perforation. Analysis focuses upon insertional pain because of its relatively high incidence, its close relationship with other insertion events [18], as well as its strong negative association with breastfeeding as revealed from our previous case-control study [9].

Patient characteristics and characteristics of the situation surrounding IUD insertion were first examined between the NBF and BF groups. Incidences of IUD insertion-related events were then compared between groups by univariate analysis, stratification and logistic regression [19]. Degree of association was computed using relative risks (RRs) or odds ratios (ORs) derived from logistic regression. A relative risk or odds ratio with 95% confidence limits (CLs, two-tailed) excluding unity was considered statistically significant. The NBF women were used as the reference group.

Results

1. Characteristics of BF and NBF women (Table 1)

Compared to the NBF women, the BF women were, in general, two years younger; less likely to have used contraceptives, especially oral contraceptives, in the month prior to this IUD insertion; and more likely to be in the postpartum/lactational amenorrhea period. The BF women, as would be expected, had a much shorter open interval (months between ending of last pregnancy and IUD insertion). Also, the BF women were somewhat more likely to have a retroverted uterus. Other variables such as number of live births, educational level, proportion living in urban areas, proportion wanting more children, type of IUD inserted and type of inserting personnel (obstetrician/gynecologist vs other types of insertors) were generally similarly distributed between the two groups. Among women who had resumed menses, the timing of IUD insertion in relation to menstrual cycle was also similar.

2. Incidences of insertion-related events, univariate analysis (Table 2)

The BF women were about two times less likely to suffer any degree of insertional pain, and three times less likely to suffer severe pain as compared to the NBF women. Per 100 women, 3.5 in the BF group and 7.5 in the NBF group experienced moderate to severe insertional pain. The incidence of severe pain was 0.6 and 2.0 per 100 women in the respective groups. Similarly, cervical dilatation was also less likely to have been necessary for BF women than for NBF women. The respective incidences per 100 women were 0.4 and 1.9. Using NBF as the reference group, the relative risk (RR) for moderate/severe pain for BF women was 0.47 (for severe pain only, RR = 0.30) and that for cervical dilatation was 0.21. All of the 95% CLs for these relative risks excluded unity.

Table 1 Selected characteristics of the non-breastfeeding and breastfeeding groups

	<i>Non-breastfeeding women (n = 3450)</i>	<i>Breastfeeding women (n = 3043)</i>
A. Patient characteristics		
Mean age in years (SD)	27.9 (5.7)	25.5 (5.0)
Mean live births (SD)	2.5 (1.6)	2.4 (1.6)
Mean education in years (SD)	6.8 (7.3)	6.6 (7.0)
% Living in urban area	71.9	70.9
Contraceptive method used in last month (%)		
IUD*	13.1	8.2
Orals	42.5	17.2
Injectables	5.3	1.7
Others	10.2	7.8
None	29.0	64.9
Uterine position (%)		
Anteverted	61.0	56.8
Retroverted	21.7	27.3
Midpositioned	14.7	10.4
Not determined	2.5	5.5
B. IUD insertion-related characteristics		
% Timing of insertion in relation to menstrual cycle (in days)		
1-5	65.8 (71.3**)	42.8 (68.3)
6-17	21.8 (23.6)	17.0 (27.1)
18+	4.8 (5.2)	2.9 (4.6)
Lactational/postpartum amenorrhea	6.3	36.2
Unspecified	1.3	1.1
Open interval (%)		
<6 months	20.3	61.3
6-11.9 months	15.9	22.7
12-23.9 months	19.1	12.8
24+ months	44.7	3.2
Type of inserter		
Obstetrician/Gynecologist	67.9	73.3
Other physician	13.2	11.0
Nurse/midwife	17.2	13.0
Others	1.7	2.6
Type of IUD inserted*** (%)		
Loops	28.5	24.3
T-shaped devices	52.6	53.6
Multiloads	18.9	22.1

* The current insertion was thus a reinsertion for these subjects. The exact length of the interval between termination of last IUD use and the current insertion is unknown except that the interval should not be longer than one month.

** Percentage distribution in parentheses is limited to women who resumed menses at insertion.

*** Loops include Loops C and D, Loop D with copper, the Tapered Loop and the Photo-reduced Loop. Copper devices include Cu-7, TCu200, TCu 380A and TCu380Ag. Multiloads include Multiload Cu250 and 375.

Table 2 Crude incidences* of various IUD insertion-related rare events by breastfeeding status at insertion

Events	Non-breastfeeding women** (n=3450)		Breastfeeding women (n=3043)		Relative risk*** (95% CLs)
	No.	%	No.	%	
Pelvic pain					
Moderate or severe	259	7.51	107	3.52	0.47 (0.37-0.59)
Severe only	69	2.00	18	0.59	0.30 (0.17-0.51)
Dilatation required	65	1.93	12	0.40	0.21 (0.11-0.39)
Cervical laceration	22	0.64	14	0.46	0.72 (0.35-1.47)
Syncope	12	0.35	13	0.43	1.23 (0.53-2.86)
Insertion failure	3	0.09	3	0.10	1.13 (0.18-6.99)
Immediate uterine perforation	2	0.06	5	0.16	2.83 (0.49-21.04)
Any events except immediate uterine perforation***	339	9.83	139	4.57	0.46 (0.38-0.56)

- * Incidences were based on the number of women for whom the event status was known
- ** Non-breastfeeding women were used as the reference group
- *** Multiple events may be reported for the same woman

Incidences of insertion failure, syncope and cervical laceration were generally similar between the two groups of women. The incidence of immediate uterine perforations was very low in both groups, but was slightly higher in the BF women than in the NBF women. The difference, however, was not statistically significant.

Considering all women with one or more IUD insertion-related events except uterine perforation, the BF women were half as likely as the NBF women to have an insertion event (RR = 0.46, 95% CLs = 0.38-0.56).

3. Stratification

The observed greater risk for NBF women of incurring insertional pain and cervical dilatation could have been biased because of differences between BF and NBF women in patient characteristics, in the situational factors surrounding IUD insertion, or in the type of IUD used. We therefore conducted an analysis of the study events stratified by these factors.

Table 3 Incidence of moderate/severe insertional pain by patient characteristics, IUD insertion situational factors and breastfeeding status at insertion

	Non-breastfeeding women* (n=3450)			Breastfeeding women (n=3043)			Relative risks* (95% CIs)
	Total women	No. with pain	%**	Total women	No. with pain	%**	
Age							
<25	1139	97	8.5	1547	70	4.5	0.53 (0.39-0.72)
25-29	1149	88	7.7	911	18	2.0	0.26 (0.15-0.43)
30+	1158	74	6.4	585	19	3.2	0.51 (0.30-0.85)
Parity							
1-2	2097	156	7.4	1978	69	3.5	0.47 (0.35-0.62)
3+	1351	103	7.6	1065	38	3.6	0.47 (0.32-0.68)
Education							
0-3 years	1185	73	6.2	1112	46	4.1	0.67 (0.46-0.98)
4-9 years	1386	141	10.2	1220	54	4.4	0.44 (0.32-0.60)
10+ years	875	45	5.1	701	7	1.0	0.19 (0.08-0.44)
Wanting additional children							
No	1859	137	7.4	1526	57	3.7	0.51 (0.37-0.69)
Yes	1587	122	7.7	1515	50	3.3	0.43 (0.31-0.60)
Contraception used in month prior to insertion							
IUD	450	19	4.2	249	7	2.8	0.66 (0.26-1.64)
OC	1466	139	9.5	530	19	3.6	0.38 (0.23-0.61)
Others (including none)	1531	101	6.6	2263	81	3.6	0.54 (0.40-0.73)
Uterine position							
Anteverted	2105	179	8.5	1729	78	4.5	0.53 (0.40-0.69)
Retroverted	748	36	4.8	832	14	1.7	0.35 (0.18-0.66)
Midpositioned	509	41	8.1	316	14	4.4	0.55 (0.29-1.02)
Timing of insertion in relation to menstrual cycle							
≤5 days	2269	218	9.6	1303	68	5.2	0.54 (0.41-0.71)
6-17 days	751	24	3.2	518	11	2.1	0.66 (0.31-1.40)
18+ days	164	10	6.1	87	7	8.0	1.52 (0.46-3.64)
Amenorrhoeic	219	3	1.4	1103	19	1.7	1.26 (0.36-5.32)
Open interval							
<6 months	700	43	6.1	1865	48	2.6	0.42 (0.27-0.64)
6-12 months	550	38	6.9	690	30	4.3	0.63 (0.38-1.03)
13-24 months	659	50	7.6	388	24	6.2	0.82 (0.49-1.33)
25+ months	1539	128	8.3	98	5	5.1	0.61 (0.22-1.48)
IUD type at this insertion							
Loops	981	190	19.4	739	86	11.6	0.60 (0.47-0.78)
T-shaped	1814	66	3.6	1632	18	1.1	0.30 (0.17-0.52)
Multiloads	653	3	0.5	672	3	0.4	0.97 (0.16-5.99)
Insertor type							
OB/GYN	2341	54	2.3	2231	23	1.0	0.45 (0.27-0.74)
Others	1106	204	18.4	811	84	10.4	0.56 (0.44-0.72)

* Non-breastfeeding women were used as the reference group

** The percentages are based on the number of subjects with valid values. Due to some subjects with unknown values, the totals may not add up to 3450 for non-breastfeeding women and 3043 for breastfeeding women

a. Moderate/severe insertional pain (Table 3)

In most cases, no matter how the data were divided, the BF women were consistently associated with a lower incidence of moderate/severe pain than the NBF women. It is especially important that this was the case when stratification was performed by age, contraceptive method used in month prior to this IUD insertion, length of open interval, and uterine position, because these variables were (1) differently distributed between the two groups of women and (2) known to be simultaneously related to both the study variable (breastfeeding) and the outcome variable (the incidence of insertional pain). Most impressive is the finding illustrated by Figure 1, that in 12 of the 18* study centers, BF women consistently had a lower incidence of pain than NBF women. When the incidence of moderate/severe pain is stratified by breastfeeding status and menstrual status at insertion, however, the consistent pattern was noticeable only in those women who had resumed menses. For women resuming menses, the incidences of moderate/severe pain were respectively 4.51 for the BF and 7.91 for the NBF women (RR = 0.57, and 95% CLs = 0.44-0.73). Among those women who were still amenorrheic, there was no significant difference in insertional pain between those who were and those who were not breastfeeding. Amenorrheic women, both in the BF and in the NBF groups, had a lower incidence of insertional pain than the corresponding menstruating women. Most of the non-menstruating and non-breastfeeding women were still in the period of lactational amenorrhea.

b. Need for cervical dilatation (Table 4)

Consistent with our findings on insertional pain, IUD insertions requiring cervical dilatation were, in general, also found to be less frequent in BF than NBF women. This finding was unaffected by age, parity, educational level, whether the IUD was inserted for family-spacing or limiting purposes, previous contraceptive method used, type of inserting personnel, IUD type used, or length of open interval. Also, the incidence of cervical dilatation was lower in the BF than the NBF group, irrespective of whether the woman was still amenorrheic or had resumed menses at the time of insertion. Seven of the 18 centers** had a lower proportion of cervical dilatation for the BF women than for the NBF women (Figure 2).

*Among the six centers not exhibiting the consistent patterns (Figure 1), three did not report any cases of moderate/severe insertional pain in either group. One center reported identical incidences between the two groups. In another center, there were only 35 NBF women, none of whom reported pain. One of the 122 BF women in this center complained of pain. Only the last center had adequate numbers of NBF ($n=396$) and BF ($n=369$) women; one of the NBF women and three of the BF women reported pain.

**In another eight centers, there were no dilatations in either group. One center reported identical incidences in the two groups of women. Only in the remaining two centers was the incidence of cervical dilatation higher for BF than for NBF women (one center had <80 women in each group).

Table 4 Incidences of cervical dilatation performed to facilitate IUD insertion by patient characteristics, IUD insertion situational factors and breastfeeding status at insertion

	Non-breastfeeding women* (n=3450)			Breastfeeding women (n=3043)			Relative risks* (95% CIs)
	Total women	No. with dilatation	%**	Total women	No. with dilatation	%**	
Age							
<25	1095	26	2.4	1518	3	0.2	0.08 (0.02-0.29)
25-29	1131	25	2.2	904	6	0.7	0.30 (0.11-0.76)
30+	1145	14	1.2	577	3	0.5	0.42 (0.10-1.56)
Parity							
1-2	2043	46	2.2	1944	6	0.3	0.14 (0.05-0.33)
3+	1330	19	1.4	1055	6	0.6	0.40 (0.14-1.05)
Education							
0-3 years	1122	7	0.6	1074	4	0.4	0.60 (0.15-2.25)
4-9 years	1377	22	1.6	1214	3	0.2	0.15 (0.04-0.54)
10+ years	872	36	4.1	701	5	0.7	0.17 (0.06-0.46)
Wanting additional children							
No	1833	31	1.7	1510	6	0.4	0.23 (0.09-0.59)
Yes	1538	34	2.2	1487	6	0.4	0.18 (0.07-0.45)
Contraception used in month prior to insertion							
IUD	447	12	2.7	246	1	0.4	0.15 (0.01-1.10)
OC	1428	28	2.0	515	1	0.2	0.10 (0.01-0.67)
Others (including none)	1497	25	1.7	2237	10	0.4	0.27 (0.12-0.58)
Uterine position							
Anteverted	2071	42	2.0	1708	8	0.5	0.23 (0.10-0.51)
Retroverted	733	12	1.6	828	3	0.4	0.22 (0.05-0.83)
Midposition	487	9	1.8	300	1	0.3	0.18 (0.01-1.36)
Timing of insertion in relation to menstrual cycle							
<5 days	2198	39	1.8	1263	8	0.6	0.36 (0.15-0.79)
6-17 days	747	17	2.3	515	3	0.6	0.26 (0.06-0.91)
18+ days	165	8	4.8	87	0	0.0	***
Amenorrhoeic	218	1	0.5	1102	1	0.1	0.20 (0.01-7.22)
Open interval							
<6 mos.	671	9	1.3	1847	6	0.3	0.24 (0.08-0.74)
6-12 mos.	534	8	1.5	674	5	0.7	0.50 (0.14-1.65)
12-23 mos.	646	14	2.2	380	1	0.3	0.12 (0.01-0.87)
24+	1522	34	2.2	96	0	0.0	***
IUD type at this insertion							
Loops	966	10	1.0	727	7	1.0	0.93 (0.32-2.63)
T-shaped	1755	33	1.9	1600	5	0.3	0.17 (0.06-0.44)
Multiloads	652	22	3.4	672	0	0.0	***
Insertor type							
OB/GYN	2274	51	2.2	2192	8	0.4	0.16 (0.07-0.35)
Others	1098	14	1.3	806	4	0.5	0.39 (0.11-1.26)

* Non-breastfeeding women were used as the reference group

** The percentages are based on the number of subjects with valid values. Due to some subjects with unknown values, the totals may not add up to 3450 for non-breastfeeding women and 3043 for breastfeeding women

*** The relative risk cannot be calculated

c. Other IUD insertion-related events (Table 5)

Incidences of other events were too low for stratified analysis. Stratification by IUD type showed a somewhat higher risk of immediate uterine perforation and a lower risk of syncope for BF as compared to NBF women, both for Loop users only. Neither of these differences was statistically significant.

4. *Multivariate analysis: logistic regression (Table 6)*

Stepwise logistic regression analysis was used to examine the independent effect of breastfeeding on the two events, moderate/severe insertional pain and need for cervical dilatation. Breastfeeding status (yes vs no) was forced into each model, and then other covariates were allowed to enter. The variables with the opportunity to enter the model were: age (<25 vs ≥25 years), IUD use, OC use, menstrual status (amenorrhea vs resumed menses), open interval (<12 months vs ≥12 months), and Center (Center O vs other centers for pain, Center A vs other centers for dilatation). For models of insertional pain and need for dilatation, center was the first covariate to enter the model. Two other covariates were important in modelling pain: open interval and OC use; two other covariates also entered the dilatation model: menstrual status and age.

When center was the only additional covariate in the insertional pain model, the adjusted odds ratio for breastfeeding was 0.55 (95% CLs = 0.43-0.71). After all three of the additional important covariates had entered this model, the effect of breastfeeding was reduced (odds ratio = 0.76, 95% CLs = 0.57-1.02). For the dilatation model, the adjusted odds ratio for breastfeeding was 0.18 (95% CLs = 0.09-0.34) when center was the only additional covariate, and was 0.51 (95% CLs = 0.25-1.01) when all three of the additional important covariates were in the model.

5. *The effect of degree of breastfeeding (Table 7)*

We further divided the BF women into full and partial breastfeeding to see if there was a 'dose-response' in the breastfeeding effect on pain and dilatation. Table 7 shows that both breastfeeding groups had lower incidences for both events than the non-breastfeeding group, but full breastfeeding offered no extra protective effect as compared to partial breastfeeding. This is a crude breakdown of breastfeeding since we have no duration or frequency information.

Table 5 Incidences of syncope and immediate uterine perforation at IUD insertion by breastfeeding status and IUD type

Device type	Non-breastfeeding women* (n = 3450)			Breastfeeding women* (n = 3043)			p-value by Fisher's Exact Test
	Total women	No. with event	%	Total women	No. with event	%	
A. Event of syncope							
Loops	981	12	1.22	738	7	0.95	0.648
T-shaped devices	1815	0	0.00	1632	2	0.12	0.224
Multiloads	653	0	0.00	672	4	0.59	0.124
B. Event of immediate uterine perforation							
Loops	982	0	0.00	739	3	0.40	0.079
T-shaped devices	1815	1	0.06	1632	1	0.06	1.000
Multiloads	653	1	0.15	672	1	0.15	1.000

*Due to some unknown values, the totals may not add up to 3450 for non-breastfeeding women and 3043 for breastfeeding women

Table 6 Adjusted odds ratio and 95% confidence limits (CLs) for the effect of breastfeeding at IUD insertion on (A) moderate/severe insertional pain and (B) need for cervical dilatation

	Odds ratio* for breastfeeding women	95% CLs	p-value
A. Moderate/severe insertional pain			
Controlling for			
a. Center (O vs others)	0.55	0.43-0.71	<0.001
b. Center and two other confounding variables: Open interval (< 12 months vs ≥ 12 months) and OC use in month prior to insertion	0.76	0.57-1.02	0.059
B. Cervical dilatation			
Controlling for			
a. Center (A vs others)	0.18	0.09-0.34	<0.001
b. Center and two other confounding variables: Menstrual status (amenorrhea vs resumed menses) and age (< 25 vs ≥ 25)	0.51	0.25-1.01	0.043

*Non-breastfeeding women were used as the reference group. The odds ratios were derived from a stepwise logistic regression model with the insertion event (pain or dilatation) as the dependent variable and with breastfeeding status forced to enter the model

Table 7 Incidence of (A) moderate/severe insertional pain and (B) cervical dilatation performed to facilitate IUD insertion by extent of breastfeeding at insertion

	Total women*	No. with event	%	Relative risk (95% CIs)
A. Event of moderate/severe insertional pain				
Non-breastfeeding	3448	259	7.51	1.00
Partial breastfeeding	1362	29	2.13	0.30(0.20-0.44)
Full breastfeeding	1681	78	4.64	0.63(0.49-0.82)
B. Event of cervical dilatation				
Non-breastfeeding	3373	65	1.93	1.00
Partial breastfeeding	1328	4	0.30	0.16(0.05-0.45)
Full breastfeeding	1671	8	0.48	0.25(0.11-0.54)

*Due to some unknown values, the totals may not add up to 3450 for non-breastfeeding women and 3043 for breastfeeding women

Discussion

Our findings from this 'prospective' study generally agree with findings from previous case-control studies. Breastfeeding exerts a protective effect on the incidence of moderate/severe insertional pain, and also a beneficial effect of reducing the need for cervical dilatation to facilitate IUD insertion. An association between breastfeeding and other IUD insertion-related rare events, namely insertion failure, syncope and cervical laceration, was, however, not detected. Our analysis does suggest that uterine perforation at IUD insertion may be more likely to occur in a BF woman receiving a Loop device.

The study designs of the case-control approach and the prospective approach have individual strengths and weaknesses. They are, however, methodologically complementary and when they produce similar findings, the validity of the findings is greatly enhanced. Two additional aspects strengthen the validity of our findings: (1) the outcome variables under study are those that occurred during and were recorded immediately after IUD insertion, so the reporting of these events is likely to be complete and not subject to recall bias (for the case-control approach) or subject to bias due to loss of follow-up (for the prospective approach) and (2) the potential beneficial effect of breastfeeding on reduction of insertional pain and the need for cervical dilatation had not been suspected previously. Therefore, bias due to selective reporting by the women or prejudice of the insertors is not likely. That similar results were derived when controlling for potentially confounding variables, either one at a time through stratification or simultaneously through multivariate analysis, further strengthened the validity of our findings.

These findings are also supported by results from an experimental study which actually measured the IUD insertion force in 103 parous women [20]. The study found

that significantly less insertion force is needed to insert an IUD in breastfeeding, recently delivered women (1.75 newtons) compared to non-breastfeeding, long delivery interval women (2.8 newtons). In that study, breastfeeding and non-breastfeeding women were matched by IUD type and parity. Due to few non-breastfeeding women with recently delivered infants, the independent effect of breastfeeding controlling for the length of delivery interval (i.e., open interval) could not be evaluated.

One limitation of our data set is the lack of information regarding the length of time women had breastfed in the past (for NBF women) or had been breastfeeding (for BF women) at the time the IUD was inserted. It is possible that, in our study, an NBF woman might have breastfed for quite some time but stopped immediately before this IUD insertion. While it is also possible that some women might have just started breastfeeding before this IUD insertion and were duly categorized as breastfeeding cases, it is thought highly unlikely. If the effect of breastfeeding on IUD insertion takes some time to appear (and to disappear), this 'misclassification' effect could produce bias; this bias would, however, underestimate rather than overestimate the differences between the BF and NBF groups. Frequency and intensity of breastfeeding could only be crudely measured by whether the breastfeeding was full or partial.

We are also cognizant of the intercenter variation and center clustering pattern in the reporting of insertional pain and cervical dilatation. The results from our analyses were probably heavily influenced by one center's data (Center O for pain and Center A for dilatation) and may lack representativeness. However, the most powerful evidence supporting the asserted breastfeeding and insertional pain association was the lower incidence of insertional pain for BF women across virtually all 18 study centers (Figure 1). To some extent, this was also true for the finding on cervical dilatation (Figure 2). No bias could produce such a consistent finding since most service providers and IUD receivers would not have expected this effect. The beneficial effect of breastfeeding on both events remained when the center effect was adjusted in the multivariate analysis. Further adjusting for other confounders, namely previous OC use and open interval for insertional pain, and menstrual status and age for dilatation, somewhat mediated the breastfeeding effect, probably due to the close correlation of the variables with breastfeeding.

Insertional pain appears to be associated with all other insertion-related events, whether as an effect (pain may be caused by cervical laceration or cervical dilatation) or as a cause (pain probably is an immediate cause for syncope and insertion failure) (Table 8). One possible reason that we did not detect a similar protective relationship between breastfeeding and these other events is that their incidences in both the BF and NBF groups were too low and the differences too minimal for a study of this size to detect.

Among the rare events under study, uterine perforation is the one with the most potentially serious medical consequences. Our suggestive finding that its risk is higher in breastfeeding women inserted with a Loop device, although in agreement with Heartwell and Schlesselman's study results [8], was based on a very small number of occurrences. An experimental *in vitro* study reported by Goldstuck, however, gives

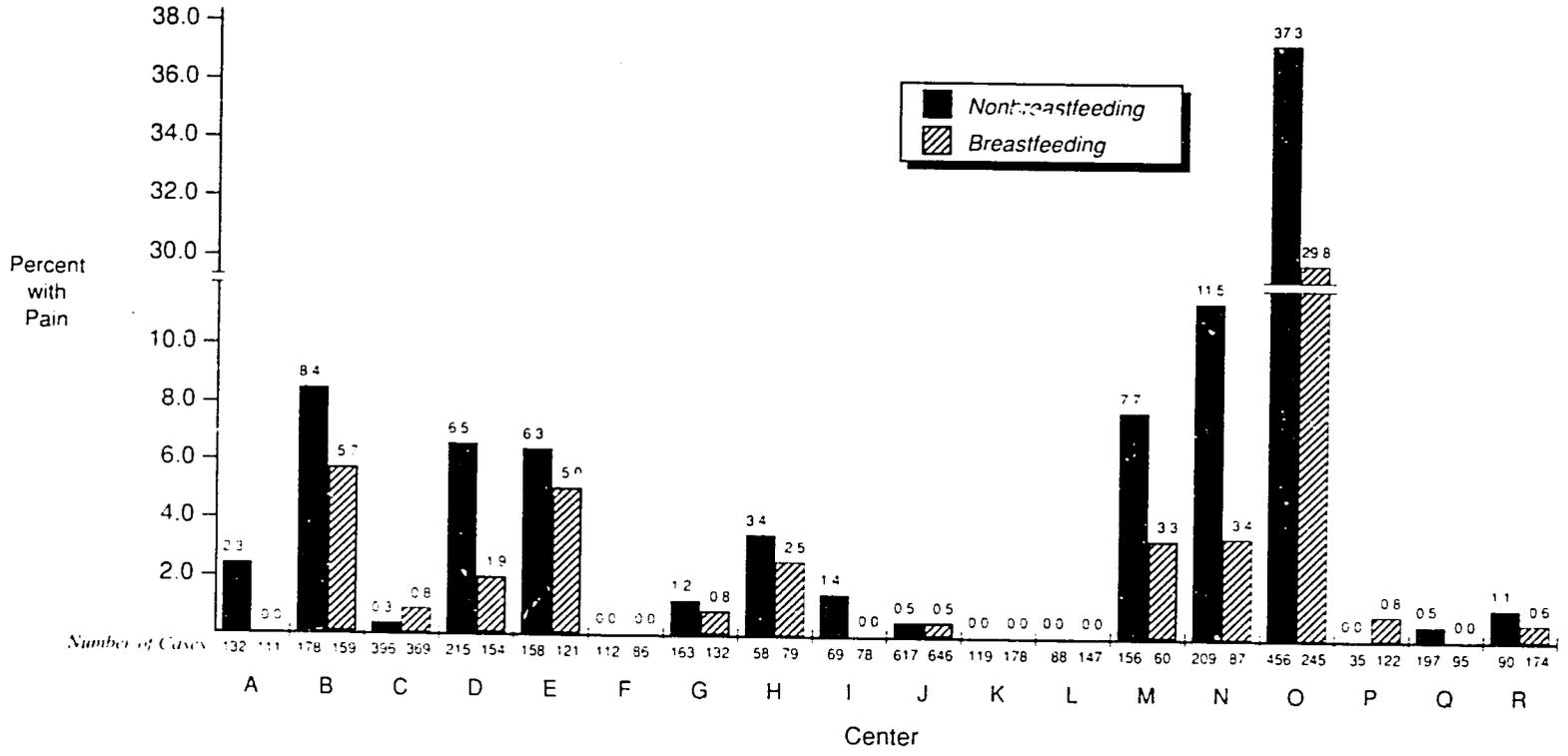


Figure 1 Incidences of moderate/severe insertional pain by breastfeeding status at insertion and by center

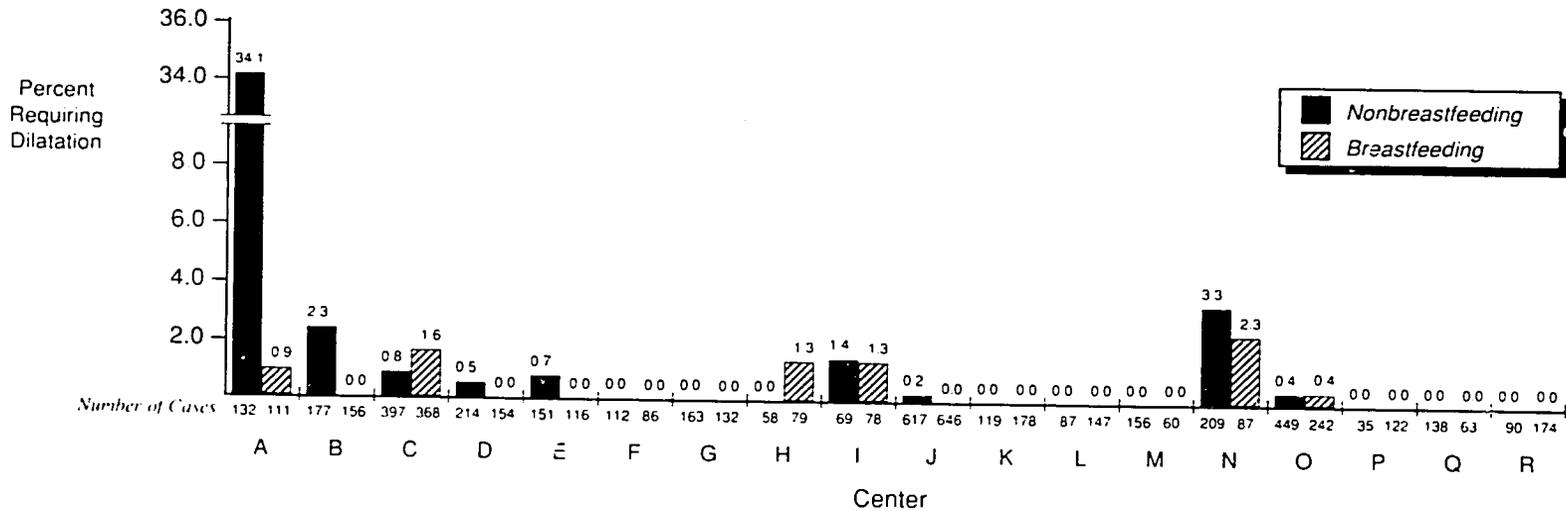


Figure 2 Incidences of cervical dilatation required to facilitate IUD insertion by breastfeeding status at insertion and by center

Table 8 Interrelationship between insertional pain and other insertion-related events by breastfeeding status at IUD insertion

		<i>Women with moderate/severe insertional pain</i>		
		<i>Total*</i>	<i>No.</i>	<i>%</i>
Cervical dilatation	(+)	77	14	18.2
	(-)	6295	345	5.5
Cervical laceration	(+)	36	5	13.9
	(-)	6456	361	5.6
B. Insertional pain leading to other events				
		<i>Women with syncope</i>		
		<i>Total*</i>	<i>No.</i>	<i>%</i>
Moderate/severe pain	(+)	366	12	3.3
	(-)	6125	13	0.2
		<i>Women with insertion failure</i>		
		<i>Total*</i>	<i>No.</i>	<i>%</i>
Moderate/severe pain	(+)	366	1	0.3
	(-)	6125	5	0.1

*Due to some unknown values, the total may not add up to 6493 study subjects

support and provides an explanation for why the Lippes Loop*, as compared to other devices, is more likely to be associated with uterine perforation [21]. If this association is true, it is possible that the lack of insertional pain in breastfeeding women makes inserters less careful during insertion. Less careful attention during insertion, coupled with the possible biological changes of the uterine wall due to lactation, could contribute to a greater risk of immediate uterine perforation at IUD insertion for breastfeeding women.

While not directly relevant, other risk factors delineated in this study were also delineated in our previous case-control studies [18]. For example, from both types of study approaches, we found that women who were younger than 25 (*vs* older women), had used OCs prior to this insertion (*vs* those using no or other methods), had an open interval of one or more years (*vs* those with a shorter interval) and/or were inserted with a Loop (*vs* another IUD type) were more likely to suffer moderate/severe insertional pain. More relevant, however, is the general finding that the relative effect of these other risk factors seems to be somewhat diminished in BF women.

*According to Goldstuck, the inserter tube of the Lippes Loop is much more rigid than that of other devices, and the forces produced by the Lippes Loop are close to the lower range from uterine perforation experiments *in vitro* (about 12 newtons). The push mechanism of the insertion may also contribute to its higher risk of uterine perforation [21].

The finding of a protective effect on the incidence of pain at the time of IUD insertion associated with breastfeeding, in particular with breastfeeding and lactational amenorrhea, and with amenorrhea in breastfeeding and non-breastfeeding women, is of particular clinical importance. It has been shown that suckling episodes during lactation stimulate the release of β -endorphin in the hypothalamus of the ewe [22], and that the peripheral levels of β -endorphin rise after suckling in the rat [23]. This suckling-induced secretion of β -endorphin plays an important role in the suppression of ovarian activity during lactation. Endorphins affect several behavioral and physiological measures, and β -endorphin is clearly the most potent of these substances. It has an analgesic effect when applied centrally that is markedly more potent than morphine [24]. It is possible that a rise in β -endorphin secretion resulting from suckling in the breastfeeding women accounts for the decrease in insertion-related pain observed in these subjects. It is also reasonable to assume that breastfeeding women who are still amenorrheic maintained higher levels of endorphins as a result of more frequent suckling episodes and as a consequence this group had a higher degree of pain protection.

Estrogens promote uterine contractile activity and prostaglandin formation in the myometrium. In the vast majority of women, both breastfeeding and non-breastfeeding, who were already menstruating at the time of IUD insertion, the IUD insertion took place on days 1–17 of the menstrual cycle (Table 1). The estrogen levels present at this time of the cycle would promote uterine contractibility and prostaglandin formation in the myometrium. Conversely, amenorrheic women, breastfeeding or non-breastfeeding, would be free of this estrogenic effect. It is possible that this factor also played a role in the reduced incidence of pain at the time of insertion observed in the amenorrheic women.

With the growing cognizance of the health benefits of breastfeeding and of the superior use- and cost-effectiveness of IUDs, the number of IUD insertions in breastfeeding women will probably increase. Our study results indicate that, except for uterine perforation, interval insertions in breastfeeding women do not seem to be associated with increased incidences of insertion-related rare events. In fact, breastfeeding seems to have the beneficial effect of reducing the occurrence of insertional pain and the need for cervical dilatation. Programmatically, it appears that IUD insertion during breastfeeding should be encouraged and that compared to breastfeeding women, non-breastfeeding women may need more intensive counseling. Further epidemiological studies are definitely needed to clarify whether there is a causal association between breastfeeding and IUD-associated uterine perforation, although intuitively, uterine perforation as well as cervical laceration would seem to be more related to inserter factors than to patient characteristics. Accordingly, the cardinal rule, as asserted by Hatcher *et al.* [25], that 'everything done at the time of IUD insertion should be done slowly and gently' should be conscientiously observed for all women. Also, more basic research on the physiological and anatomical changes of the cervix and uterine wall in breastfeeding women is needed.

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Resumé

Cette étude présente les effets possibles de l'allaitement au sein sur des phénomènes liés à l'insertion de dispositifs intra-utérins (DIU). La recherche portait 6493 femmes inscrites dans plusieurs centres pour participer à des essais cliniques pendant une période de dix ans. On a constaté que l'allaitement au sein a un effet protecteur contre l'apparition de douleurs modérées à fortes au moment de l'insertion et qu'il réduit la nécessité de dilater le col utérin en vue de faciliter l'insertion. Cet effet de protection contre les douleurs prédominait chez les femmes qui allaitaient et se trouvaient encore en aménorrhée de lactation. Les douleurs au moment de l'insertion étaient significativement moins fréquentes au moment de la pose du DIU chez celles qui, allaitant ou non, étaient encore en période d'aménorrhée, que chez celles dont le cycle menstruel avait repris. Cet effet peut être lié à une sécrétion plus abondante de β -endorphine chez les femmes en période d'allaitement ou d'aménorrhée de lactation.

Resumen

Se investigaron en este estudio los posibles efectos del amamantamiento sobre la inserción de dispositivos intrauterinos (DIU). El estudio comprendió 6493 mujeres que participaron en ensayos clínicos en diversos centros durante un período de diez años. Los resultados indican que el amamantamiento ejerce un efecto protector contra la aparición de dolores moderados a fuertes en el momento de la inserción y reduce la necesidad de dilatar el cuello del útero para facilitar la inserción. Este efecto de protección contra el dolor predominó entre las mujeres que amamantaban y se hallaban aún en amenorrea de lactación. Las mujeres con amenorrea, tanto las que amamantaban como las que no lo hacían, señalaron un nivel de dolor significativamente menor en el momento de inserción del DIU que aquellas cuyo ciclo menstrual se había reanudado. Este efecto puede estar relacionado con una mayor secreción de β -endorfina en las mujeres en período de amamantamiento o de amenorrea de lactación.

SOCIETY FOR THE ADVANCEMENT OF CONTRACEPTION

Preliminary Announcement

A REGIONAL MEETING TO BE HELD IN OTTAWA, N. AMERICA

1 November 1989

This Regional meeting has been arranged to coincide with Celebrations marking the 20th Anniversary of the Legalisation of Contraception in North America.

Details of this meeting can be obtained from the President of the Society, Dr Norman Barwin, Associate Professor, Department Ob/Gyn., University of Ottawa Fertility Center, 770 Broadview Avenue, Suite B-1, Ottawa, Ontario K2A 3Z3, Canada

First Announcement

SEVENTH INTERNATIONAL CONGRESS OF THE SOCIETY

to be held 4-11 NOVEMBER 1990

at the MANDARIN HOTEL, SINGAPORE

Further details will be circulated in a later issue of *Advances in Contraception*.

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