

REVIEW ARTICLE

Breastfeeding and dummy use have a protective effect on sudden infant death syndrome

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ABSTRACT

We conducted a literature review on the effect of breastfeeding and dummy (pacifier) use on sudden infant death syndrome (SIDS). From 4343 abstracts, we identified 35 relevant studies on breastfeeding and SIDS, 27 on dummy use and SIDS and 59 on dummy use versus breastfeeding.

Conclusion: We found ample evidence that both breastfeeding and dummy use reduce the risk of SIDS. There has been a general reluctance to endorse dummy use in case it has a detrimental effect of breastfeeding. However, recent evidence suggests that dummy use might not be as harmful to breastfeeding as previously believed.

INTRODUCTION

Most countries experienced an increased prevalence in sudden infant death syndrome (SIDS) during the 1980s, followed by a dramatic decrease after supine sleeping was recommended as the normal sleeping position for infants around 1990 (1). In Sweden, SIDS decreased from 1.2 deaths per 1000 live births in 1990 to 0.2 in 2012. The original Swedish advice to parents to reduce the risk of SIDS was updated in 2003, and then, in 2006, new findings regarding dummy (pacifier) use and bed sharing were discussed. In 2014, there was a further need to discuss these factors in greater depth and to revise the advice in accordance with new findings. Moreover, there was a need to convey new information on the prevention of skull asymmetries, which had emerged as a more frequent problem as a result of the campaign to reduce the risk of SIDS and a higher prevalence of supine sleeping.

Since the 1930s (2), there have been discussions about whether bottle-feeding was a risk factor for cot death. Even though studies conducted using meta-techniques (3) pointed towards a protective effect, it was still unclear whether this was due to the physiological effect of breastmilk or whether it was a proxy for socio-economic factors (4).

The risk-reducing effect that dummy use had on SIDS was shown by Mitchell et al. in 1993 in the New Zealand Cot Death Study (5). Following this, all studies investigating this association have found similar results.

The aim of the present study was to perform a literature review on breastfeeding and dummy use and how they influenced one another and to renew the advice to the

Swedish public and to personnel working in hospitals and health services.

METHODS

Literature searches were carried out between spring 2012 and spring 2013, and this identified 4343 abstracts. We reviewed 260 abstracts on breastfeeding and SIDS, and 35 were considered relevant to the research question. When it came to dummy use and SIDS, we reviewed 112, and 27 were considered relevant. As there was a strong negative correlation between breastfeeding and dummy use, we also wanted to study this. We reviewed 301 abstracts, and 59 were relevant. After having read the full papers, we included studies showing effect measures. There were 20 concerning breastfeeding and SIDS, 13 concerning dummy use and SIDS and 21 concerning dummy and breastfeeding (Fig. 1).

Key notes

- We conducted a literature review on the effect of breastfeeding and dummy (pacifier) use on sudden infant death syndrome (SIDS), focusing on more than 100 full texts.
- Our review found ample evidence that both breastfeeding and dummy use reduced the risk of SIDS.
- There has been general reluctance to endorse dummy use in case it has a detrimental effect on breastfeeding, but recent evidence suggests it might not be as harmful to breastfeeding as previously believed

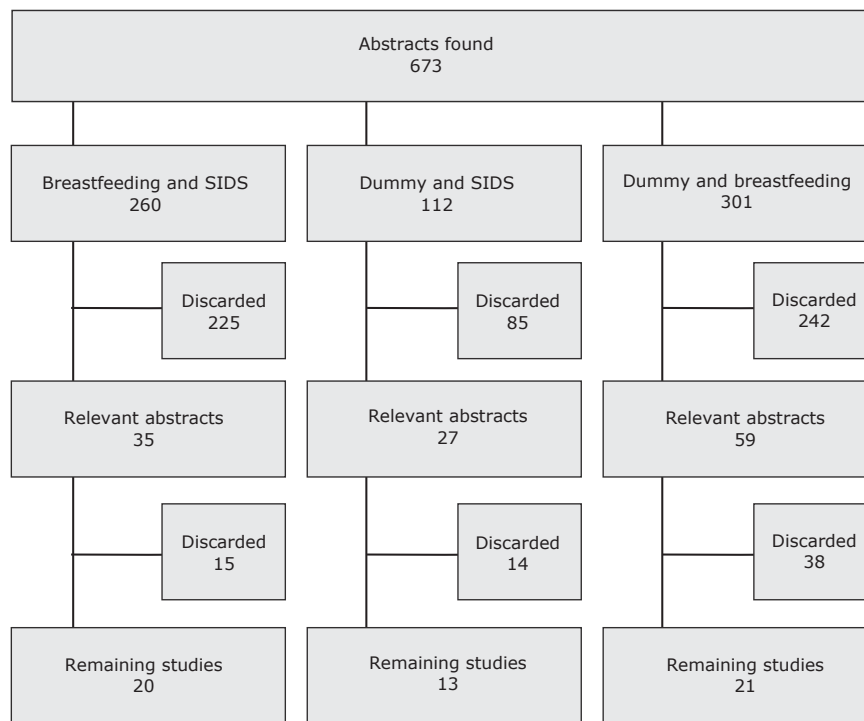


Fig. 1 Flowchart showing the number of abstracts and articles reviewed.

RESULTS

Breastfeeding and SIDS

We examined 17 observational studies (Table 1) and found that breastfeeding was reported to have provided a protective effect on SIDS in ten studies (6–15). No protective effects were found in the other seven (4,16–21).

All three of the meta-analyses that our search identified (3,22,23) showed that breastfeeding had a protective effect on SIDS.

Dummies and SIDS

We found 11 observational studies (5,14,18,24–31) that consistently showed a risk reduction of about 50% if the infant used a dummy (Table 2).

There were also two meta-analyses (32,33) that gave approximately the same odds ratio of about 0.5.

Dummies and breastfeeding

A negative correlation between the use of a dummy and successful breastfeeding was found in all 14 studies (34–47) published between 1999 and 2012 (Table 3).

A meta-analysis that covered many of these studies (48) did not alter the finding of a strong negative association. However, five randomised controlled studies (RCTs) have been performed (49–53) to date. Four of them (49,50,52,53) did not find that a dummy reduced the duration of breastfeeding, while one (51) found an increased risk of earlier weaning.

In 2011, Jaafar (54) conducted a meta-analysis on the RCTs carried out by Jenik (53) and Kramer (50), which

concluded that using a dummy did not affect the chance of exclusive breastfeeding at three months.

Pooled odds ratios

Figure 2 shows the pooled odds ratios of the seven meta-analyses: three on breastfeeding and SIDS, two on dummies and SIDS, one meta-analysis based on observational studies on dummies and breastfeeding and one meta-analysis based on two RCTs on dummies and breastfeeding.

DISCUSSION

Breastfeeding and SIDS

The mechanism behind the beneficial effect of breastfeeding is still unclear. The most common explanation is that the risk of SIDS is increased by viral infections (55) and that breastfeeding has a protective effect on these infections (56). There are also studies that show that breastfed infants are more easily aroused than bottle-fed ones. It has been suggested that this might be due to alterations in the neurochemical composition of the brain, for example, that the brains of breastfed infants contain different amounts of docosahexaenoic acid, which is a long-chain polyunsaturated fatty acid (LCPUFA) present in fish oil and breastmilk. However, since the beginning of this millennium, LCPUFAs have been added to infant formulas.

To summarise, there is a great deal of evidence pointing towards a risk-reducing effect, but it is not undisputed. If models could be more efficiently adjusted for social disadvantage, it is possible that the results of more studies might

Table 1 Studies on the association between breastfeeding and sudden infant death 1990–2012. Odds ratios with 95% confidence intervals

Study	Effect (OR (95% CI))	Comments
Observational studies		
Mitchell, <i>N Z Med J</i> 1991 (6)	aOR 2.93 (1.84, 4.67) (bottle)	162 cases and 589 controls New Zealand
Mitchell, <i>BMJ</i> 1993 (7)	aOR (bottle) maori: 2.60 (1.73, 3.91) other: 2.04 (1.46, 2.84)	485 cases and 1800 controls New Zealand
Ford, <i>Int J Epidemiol</i> 1993 (8)	Exclusive breastfeeding aOR = 0.65 (0.46, 0.91)	485 cases and 1800 controls New Zealand
Ponsonby, <i>Paediatr Perinat Epidemiol</i> 1995 (16)	Mixed aOR 1.2 (0.5, 2.7) Bottle aOR 1.8 (0.7, 4.8)	98 cases and 190 controls Tasmania
Gilbert, <i>BMJ</i> 1995 (17)	Mixed 1.8 (0.7, 4.8) Bottle 1.2 (0.5, 2.7)	98 cases and 196 controls Avon, N Somerset, England
Klonoff-Cohen, <i>JAMA</i> 1995 (9)	Overall: aOR 0.41 (0.22, 0.79) Nonsmokers: aOR 0.37 (0.19, 0.72) Smokers: aOR 1.38 (0.16, 12.03)	200 cases between 1989 and 1992 and 200 controls Five counties in Southern California
Fleming, <i>BMJ</i> 1996 (18)	aOR 1.06 (0.57, 1.98)	195 cases and 780 controls Southwest, Yorkshire and Trent, England
Schellscheidt, <i>Eur J Pediatr</i> 1997 (10)	Bottle: aOR 7.7 (2.7, 22.3)	75 cases and 156 controls Münster, Germany
Mitchell, <i>Pediatrics</i> 1997 (19)	Breastfeeding 1.32 (0.72, 2.41) Exclusive breastfeeding 1.54 (0.95, 2.46)	127 cases and 922 controls New Zealand
l'Hoir, <i>Arch Dis Child</i> 1998 (11)	aOR 0.09 (0.01, 0.88)	73 cases and 146 controls The Netherlands
Tanaka, <i>Environ Health Prev Med</i> 2001 (12)	Bottle: aOR 4.92 (2.78, 9.63).	386 cases and 386 controls Japan Autopsy rate 36%
Törö, <i>Scand J Prim Health Care</i> 2001 (20)	Crude OR 1.8 (0.6, 5.9)	18 cases and 74 controls Budapest, Hungary Small study
Alm, <i>Arch Dis Child</i> 2002 (13)	Exclusive breastfeeding >4 months aOR 0.2 (0.1, 0.4) Any breastfeeding aOR 0.2 (0.1, 0.5)	244 cases and 869 controls Denmark, Norway and Sweden
Fleming, <i>Paediatr Perinat Epidemiol</i> 2003 (4)	aOR 1.15 (0.77, 1.72)	323 cases and 323 controls with a similar socio-economic profile 363 cases and 1452 controls The Confidential Enquiry into Stillbirths and Deaths in Infancy, UK
Hauck, <i>Pediatrics</i> 2003 (14)	Breastfeeding (ever) aOR 0.4 (0.2, 0.7) Breastfeeding (current) aOR 0.3 (0.2, 0.7)	260 cases and 260 controls Chicago
Chen, <i>Pediatrics</i> 2004 (21)	Crude OR 0.84 (0.67, 1.05)	1204 cases and 7740 controls 1988 National Maternal and Infant Health Survey (NMIHS) data
Venneman, <i>Paediatrics</i> 2009 (15)	Exclusive breastfeeding aOR: 0.27 (0.13, 0.56) Mixed feeding aOR: 0.29 (0.16, 0.53)	333 cases and 998 controls Germany
Meta-analyses		
McVea, <i>J Hum Lact</i> 2000 (22)	OR 2.11 (1.66, 2.68)	19 studies, 1966–1997
Ip, <i>Breastfeed Med</i> 2009 (23)	Any breastfeeding: aOR 0.64 (0.51, 0.81)	Six studies, published after McVea 2000
Hauck, <i>Pediatrics</i> 2011 (3)	Summary OR: sOR 0.55 (0.44, 0.69)	18 studies, 1966–2009

Table 2 Studies on the association between the use of dummy and sudden infant death 1990–2012. Odds ratios with 95% confidence intervals

Study	Effect [OR (95% CI)]	Comments
Observational studies		
Mitchell, <i>Arch Dis Child</i> 1993 (5)	Any use aOR 0.71 (0.50, 1.01)	485 cases and 1800 controls New Zealand
Fleming, <i>BMJ</i> 1996 (18)	Last sleep aOR 0.43 (0.24, 0.78) aOR 0.38 (0.21, 0.70)	195 cases and 780 controls CESDI, UK
Arnestad, <i>Eur J Pediatr</i> 1997 (24)	Night: OR 0.27 (0.14, 0.51) Day: OR 0.36 (0.19, 0.69)	167 cases and 352 controls Norway
Fleming, <i>Arch Dis Child</i> 1999 (25)	aOR 0.41 (0.22, 0.77)	325 cases and 1300 controls CESDI, UK
L'Hoir, <i>Eur J Pediatr</i> 1999 (26)	Usually aOR 0.24 (0.11, 0.51) Last sleep aOR 0.16 (0.07, 0.36)	73 cases and 146 controls The Netherlands
McGarvey, <i>Arch Dis Child</i> 2003 (27)	aOR 5.83 (2.37, 14.36)	203 cases and 622 controls Ireland
Hauck, <i>Pediatrics</i> 2003 (14)	aOR 0.3 (0.2, 0.5)	260 cases and 260 controls Chicago, USA
Vennemann, <i>Acta Paediatr</i> 2005 (28)	aOR 0.39 (0.25, 0.59)	333 cases and 998 controls GeSID, Germany
Li, <i>BMJ</i> 2006 (29)	aOR 0.08 (0.03, 0.21)	185 cases and 312 controls 11 counties in California
Thompson, <i>J Pediatr</i> 2006 (30)	Face down: aOR 1.18 (0.57, 2.47) Face up: aOR 0.18 (0.07, 0.48)	485 cases and 1800 controls New Zealand Cot Death Study
Moon, <i>Matern Child Health J</i> 2012 (31)	aOR 0.30 (0.17, 0.52)	260 cases and 260 controls Chicago, USA
Meta-analyses		
Hauck, <i>Pediatrics</i> 2005 (32)	Usually aOR 0.71 (0.59, 0.85) Last sleep aOR 0.39 (0.31, 0.50)	7 studies, 1966–2004
Mitchell, <i>Pediatrics</i> 2006 (33)	Routine use Pooled OR 0.83 (0.75, 0.93) Last sleep Pooled OR 0.48 (0.43, 0.54)	Routine use, 7 case–control studies Last sleep, 8 case–control studies

deviate towards nonsignificance. However, breastfeeding during the first months of life is desirable for many reasons and whether or not it has a protective effect on SIDS should not affect the recommendation to breastfeed for as long as possible and whenever feasible.

Dummies and SIDS

The way in which a dummy can reduce the risk of SIDS is still unclear. It has been suggested that it could interfere with the auditory arousal threshold and modify the autonomous control of the heart. However, in another study, it has been shown that there is no difference in the number of awakenings between infants using or not using dummies.

It has also been suggested that the mechanism could be purely mechanical, as sucking a dummy induces a forward movement of the mandible (57).

A position paper from the Physiology and Epidemiology Working Groups of the International Society for the Study and Prevention of Perinatal and Infant Death suggested that it is not the dummy *per se* that confers the protection, but that it is a proxy for something else. A very plausible suggestion is that the more arousable babies are given a dummy more frequently and that these may be innately protected, as they are more easily aroused from sleep (58).

Dummies and breastfeeding

The fact that 20 of the 21 studies found a correlation between dummy use and unsuccessful breastfeeding is a strong indication that this is a real association. The interpretation of this has been that the dummy interferes with breastfeeding initiation and continuation, which has

Table 3 Studies of the association between using a dummy and breastfeeding 1999–2012. Odds ratios, relative risks and hazard ratios with 95% confidence intervals

Study	Effect (OR (95% CI))	Comments
Observational studies		
Vogel, <i>Acta Paediatr</i> 1999 (34)	Risk for shorter duration of breastfeeding of daily dummy use: a OR 1.62 (1.20, 2.18)	350 mother–infant pairs New Zealand
Riva, <i>Acta Paediatr</i> 1999 (35)	Pacifier use was significantly associated with stopping breastfeeding: Partial breastfeeding aOR 1.18 (1.04, 1.34) Exclusive breastfeeding aOR 1.35 (1.18, 1.55)	1601 mothers Italy
Aarts, <i>Pediatrics</i> 1999 (36)	Hazard ratio for shortening of breastfeeding duration Dummy use: Often aOR 1.62 (1.28, 2.07) Frequent aOR 2.17 (1.53, 3.09)	506 mother–infant pairs, Sweden
Howard, <i>Pediatrics</i> 1999 (37)	The introduction of a dummy at six weeks was associated with a significantly increased risk of shortened breastfeeding. Hazard ratio, 1.53 (1.15, 2.05), (exclusive) hazard ratio 1.61 (1.19, 2.19) (any)	265 breastfeeding mothers. Greater Rochester, NY, US
Vogel, <i>J Paediatr Child Health</i> 2001 (38)	Early cessation, aRR 1.71 (1.29, 2.28) Reduced duration of exclusive breastfeeding, aRR 1.35 (1.05, 1.74)	350 mothers with infants born from May to December 1996 at North Shore Hospital, Auckland, New Zealand
Marques, <i>Pediatrics</i> 2001 (39)	A dummy in the first week increased the risk of formula within one month. aOR 4.01 (2.07, 7.78)	364 mothers from four small cities in Pernambuco, north-eastern Brazil
Ingram, <i>Midwifery</i> 2002 (40)	Not using a dummy was significantly associated with breastfeeding at two weeks aOR 2.6 (1.6, 4.0)	1400 mothers from South Bristol, England, who were breastfeeding at discharge.
Binns and Scott, <i>Breastfeed Rev</i> 2002 (41)	A dummy at two weeks was inversely associated with breastfeeding at six months aOR 0.40 (0.25, 0.63)	556 mothers Perth, Australia
Giovannini, <i>Acta Paediatr</i> 2004 (42)	A dummy in the first month of life increased the risk of cessation of exclusive breastfeeding. aOR 1.28 (1.13, 1.45)	2450 infants randomly chosen from all infants born in November 1999 in Italy.
Nelson, <i>J Hum Lact</i> 2005 (43)	A dummy (sometimes or often) increased the risk of bottle-feeding. aOR 2.35 (1.61, 3.42) ('sometimes') aOR 4.56 (2.33, 8.91) ('often')	2844 infants The International Child Care Practices Study (ICCPs); 21 centres in 17 countries (America, Europe, Asia and Oceania)
Scott, <i>Pediatrics</i> 2006 (44)	The introduction of a dummy before the age of four weeks increased the risk of non-exclusive breastfeeding at six months. aOR 1.92 (1.39, 2.64)	587 women Perth, Australia
Santo, <i>Birth</i> 2007 (45)	A dummy in the first month increased the risk of cessation of exclusive breastfeeding before six months. Hazard rate 1.53 (1.12, 2.11)	220 healthy mother–infant pairs Porto Alegre, Brazil
Kronborg, <i>Birth</i> 2009 (46)	A dummy in the first two weeks increased the risk of breastfeeding cessation before six months. aOR 1.42 (1.18, 1.72)	570 mother–infant pairs in western Denmark
Feldens, <i>Matern Child Health J</i> 2012 (47)	A dummy in the first month increased the risk of breastfeeding cessation before one year of age. aRR 3.12 (2.13, 4.57)	360 participants Sao Leopoldo in southern Brazil
Meta-analyses on observational studies		
Karabulut, <i>Turk J Pediatr</i> 2009 (48)	Dummy use reduced the duration of any breastfeeding: cOR 2.760 (2.083, 3.657) aOR 1.952 (1.662, 2.293)	Twelve trials with weaning from exclusive breastfeeding and 19 trials with cessation of any breastfeeding. 1993–2005
Randomised controlled studies (RCTs)		
Schubiger, <i>Eur J Pediatr</i> 1997 (49)	No significant differences between groups. 'UNICEF' vs. 'standard': day 5: 100% vs. 99%; two months: 88% vs. 88%; four months: 75% vs. 71%; six months: 57% vs. 55%	UNICEF group: 294 'Standard' group: 308 The 'standard' group was offered a dummy and formula. Ten maternity services at Swiss hospitals

Table 3 (Continued)

Study	Effect (OR (95% CI))	Comments
Kramer, <i>JAMA</i> 2001 (50)	At three months, 18.9% of the intervention group were weaned and, in the control group, 18.3%. RR 1.0 (0.6, 1.7)	258 infants The intervention consisted of a recommendation to abstain from a dummy and suggestions of other comforting measures. Montreal, Quebec
Howard, <i>Pediatrics</i> 2003 (51)	Early, as compared with late, dummy use shortened overall duration (adjusted hazard ratio: 1.22 (1.03, 1.44) but did not affect exclusive or full duration	700 infants Rochester General Hospital, Ohio, USA
Collins, <i>BMJ</i> 2004 (52)	Any breastfeeding three months after discharge 0.99 (0.56, 1.77) Any breastfeeding six months after discharge 1.23 (0.66, 2.30)	319 preterm (23–33 week) infants Two hospitals in Australia between April 1996 and November 1999
Jenik, <i>J Pediatr</i> 2009 (53)	Risk difference 0.4% (–4.9%, 4.1%)	1021 mothers highly motivated to breastfeed. Five hospitals in Argentina
Meta-analyses on RCTs Jaafar, <i>Cochrane Database Syst Rev</i> 2011 (54)	Dummy use in healthy breastfeeding infants had no significant effect on the proportion of infants exclusively breastfed at three months RR 1.00 (0.95, 1.06)	Two RCTs, 1302 infants (included Jenik 2009 and Kramer 2001; excluded Schubiger 1997, Collins 2004 and Howard 2003)

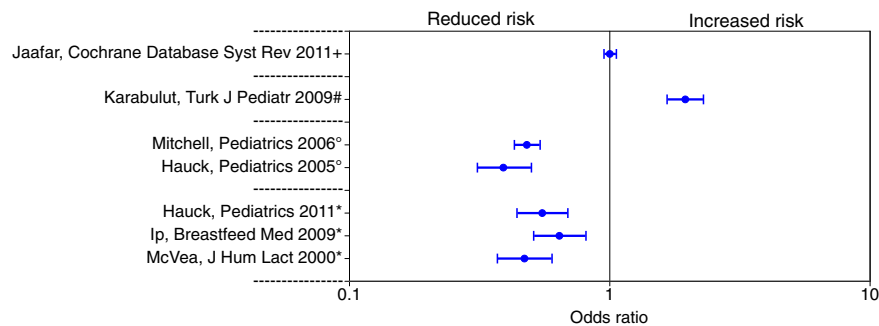


Fig. 2 Pooled odds ratios from meta-analyses of: (+) two randomised controlled studies on the effect of a dummy on breastfeeding duration, (#) observational studies on the effect of a dummy on shortened breastfeeding, (°) observational studies on the effect of dummy use on sudden infant death syndrome (SIDS) and (*) observational studies on the effect of breastfeeding on SIDS.

led to the practice of advising against the use of dummies in breastfeeding promotion. The ninth of the ten 'steps to successful breastfeeding' from the World Health Organization says 'Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants'.

However, many of these studies raise the question themselves of whether this association is real or an example of reverse causation, in that failing to breastfeed is the primary event that triggers the need to relieve the need for sucking by soothing the baby with a dummy. However, the design of the studies makes it impossible to determine the direction of the causality.

As so many of the reviewed studies showed this strong negative association, it is not surprising that a meta-analysis (48) comes to the same conclusion. However, several RCTs (despite several drawbacks, even in the well-designed ones) and a meta-analysis of the two least problematic RCTs,

found no increased risk of unsuccessful breastfeeding following the introduction of dummies. These findings strengthen the case to not advise against a dummy after breastfeeding has been established, which usually occurs within two weeks in term infants.

Of course this recommendation has been discussed and one argument that has been advanced, when weighing the risk-reducing effect of dummy use against the possible detrimental effect on breastfeeding, is that cases of SIDS are rare in the first two weeks of life. It is true that the incidence peaks later, around two months of age, but a Swedish study of 128 SIDS cases between 2005 and 2010 showed that 6.3% had occurred in the first 14 days and 18% in the first month of life (59). This poses a problem about the ideal time for introducing a dummy, which cannot be solved by general guidelines and must be decided individually for each mother–infant pair.

Shortcomings of the included studies

This review is mainly based on observational studies, but five RCTs have been conducted concerning the relationship between dummies and breastfeeding.

Randomised controlled studies are the gold standard in causal inference, but noncompliance and other protocol violations can reduce their value, which to some extent is the case with the RCTs in this review. This is, of course, due to the nature of the relationship studied. However, at least it is possible to conduct an RCT on the relationship between dummies and breastfeeding. Studying SIDS by randomising dummy use or breastfeeding would be highly unethical. In these cases, we are compelled to rely on evidence from observational studies, even though they are prone to issues like reverse causation and other misinterpretations of causality. Hill's criteria may be of some use in these situations, but even they do not set sharp lines between causation and noncausation (60).

CONCLUSION

We found scientific evidence that both breastfeeding and dummy use have a risk-reducing effect on sudden infant death syndrome. The most recent studies available at the time of this review showed that dummy use might not be as harmful to breastfeeding as previously believed.

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