

Effect of Pacifier Use in Sudden Infant Death Syndrome

Pallavi Pujar¹, Niraj Gokhale²

¹Senior lecturer, Department of Peodontics and Preventive Dentistry, Maratha Mandal's Nathajirao G. Halgekar's Institute of Dental Sciences Research Centre, Belagavi 590010, Karnataka, India.

²Lecturer, Department of Peodontics and Preventive Dentistry, KLE's VK Institute of Dental Sciences Nehru Nagar, Belagavi 590010, Karnataka, India

Abstract: ***Introduction:** Despite declines in prevalence during the past two decades, sudden infant death syndrome (SIDS) continues to be the leading cause of death for infants aged between 1 month and 1 year in developed countries. Evidence also suggests that pacifier use at sleep time and room sharing without bed sharing are associated with decreased risk of SIDS. Hence this review was made to assess the effect of pacifier use and its relation to Sudden Infant Death Syndrome (SIDS). **Materials and Methods:** A hand search for the articles was made along with search over the internet by using the mESH terms "Sudden Infant Death Syndrome" "Pacifier" "Pacifier and Sudden Infant Death Syndrome" Out of the literature search made only 30 articles which matched the mESH terms were included in the review. **Conclusion:** The review of literature suggested that the use of pacifier has led to decrease in the incidence of SIDS but though the cause of SIDS is unknown, immature cardiorespiratory autonomic control and failure of arousal responsiveness from sleep are also important factors.*

Keywords: feeding, nursing, pacifier, sleep, sudden infant death syndrome

1. Introduction

Sudden infant death syndrome (SIDS) is defined as "the sudden death of an infant less than 1 year of age which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history."¹

A pacifier is defined as "an object that a baby is given to suck so that the baby feels comforted and stays quiet".¹ Pacifiers, colloquially known as "dummies", "soothers", "comforters", and "artificial teats" in the English speaking world, are used widely to soothe or calm a distressed child.² Pacifiers are also used to prevent the sucking of thumbs and other objects, and as an aid to weaning. Pacifier use is frequently associated with "non-nutritive sucking" in the medical literature.

2. Methodology

A hand search for the articles was made along with search over the internet by using the mESH terms "Sudden Infant Death Syndrome" "Pacifier" "Pacifier and Sudden Infant Death Syndrome" Out of the literature search made only 30 articles which matched the mESH terms were included in the review.

3. Association

The association between pacifiers and sudden infant death syndrome has been known for some time. A possible protective effect was proposed in 1979 by Cozzi et al suggesting that the use of a pacifier might reduce the risk of SIDS. Mitchell et al and several others have suggested an association.^{3-11.}

4. Aetiology

The aetiology of SIDS is poorly understood, however, epidemiological research has identified a number of factors and modifiable infant care practices which appear to increase or decrease the risk. Key practices found to increase the risk include: prone sleeping, antenatal and postnatal cigarette smoke exposure, and hyperthermia.^{2,12,13,14.} Important practices reported to reduce the risk of SIDS include: breastfeeding¹⁵, room-sharing¹⁶, and pacifier use.^{2,4} While, it is internationally accepted that SIDS may take place between the ages of seven days to one year, L'Hoir et al.⁹ included children up to the age of two years.

A. Epidemiological Evidence

In 1993, Mitchell and in 1996 Fleming reported that pacifiers had protective effect against SIDS in a case-control studies and few deaths were reported among pacifier users.^{2, 17, 18} In a Norwegian study, the estimated odds ratio of pacifier use to deaths ranged between 0.27 to 0.59 (1.5 to 4 times less risk).¹⁹ In a study, pacifier use was found to be a preventive factor for SIDS independent of other factors such as making the child sleep in prone position and use of soft bedding. A case-control study carried out in Netherlands showed that there was a preventive effect associated with pacifier use with an odds ratio of 0.05.⁹ In a population-based case-control study in Chicago from 1993 to 1996, showed that pacifier use was associated with decreased risk (unadjusted Odds Ratio being in range of (0.2 -0.5).⁵ Meta-analysis of the published research evaluating the strength of evidence on the use of pacifiers as a protective measure against SIDS concluded that there was a strong correlation between pacifier use and reduced risk of SIDS.¹⁴

Cozzi et al suggested that in sudden infant death syndrome a vacuum might occur in the pharynx, pulling the tongue back

and blocking the airway. They suggested that the dummy might prevent the tongue from sealing off the airway. Though the physiologic mechanism to explain the protective nature of pacifiers against SIDS remains unclear, there are many theories. These include:

1. *Infant Sleep Position*: a pacifier may discourage an infant from turning to the stomach position while sleeping. With the use of pacifiers it was found that there were decreased rollovers by the infants but increased rotation around the crib.⁹ A German study found that there was no significant association between the use of a pacifier and the prone sleep position. The results provide strong evidence confirming an association between the prone sleeping position and an increased risk of SIDS. The study shows that risk of SIDS is also increased for infants placed in the side position, although the data suggest that the increased risk for the side position may be due to the instability of this position and the tendency of infants placed in the side position to turn to a prone position. Most importantly, the study demonstrates that infants who are put to sleep in an unaccustomed prone or side position are at greater risk of SIDS than those who are always put to sleep in the prone or side position (an accustomed prone or side position).¹¹
2. *Infant Arousal during Sleep*: research on infant arousal and pacifier use suggested that pacifier users have lower auditory thresholds than non-pacifier users.¹⁹ Infants may arouse more easily when pacifiers fall out during sleep.
3. *Airway And/Or Respiration Effects*: The use of pacifier use may make it easier for infants to keep their airways free due to changes in the infant tongue position.
4. *Unknown Variable*: Pacifier use may also be a marker for some undiscovered variable such as the mother's behavior or an infant characteristic.¹³

Airway compromise or restriction and effects on respiration.

- 1) Pacifier use may keep the tongue in a more forward position or restriction and reducing the possibility of airway occlusion, particularly in the effects on respiration supine position.
- 2) Pacifier use may increase upper airway muscle tone and reduce the likelihood of airway collapse during sleep.
- 3) Pacifiers may reduce the number and severity of apneic periods by stimulating respiratory drive.
- 4) Pacifier use raises the infant's carbon dioxide level slightly. This acts as a respiratory stimulant and lowers the infant arousal threshold.
- 5) Pacifiers may ease the transition to oral breathing from nasal breathing if the nasal airway becomes occluded.

Sleep position.

- 1) Pacifiers may prevent an infant from turning to a prone position. If turned in that position, the pacifier may keep the infant's nose off the bed. The prone position has been associated with a risk for SIDS.
- 2) An infant with a pacifier may be more likely to keep its nose free of bedding to maintain an adequate air supply.
- 3) Because the pacifier is associated with pleasure and satisfaction, its use will promote less movement during sleep to reduce the risk of losing the pacifier.

- 4) A pacifier quiets a restless infant and reduces the likelihood that the infant will place its head under the bedcovers.

Infant Arousal

- 1) Pacifiers may decrease the arousal threshold for infants during sleep
- 2) Frequent loss of the pacifier during sleep may cause arousal.

Miscellaneous Suggestions

- 1) Pacifiers may reduce the potential for gastroesophageal reflux.
- 2) Pacifiers may stimulate saliva production, which, in turn, may provide protection against SIDS through unknown means.
- 3) The production of saliva stimulates swallowing, which may play some protective role.
- 4) Pacifiers may stimulate the release of somatostatin and gastrin, which may have some protective effect.
- 5) Pacifier use by the infant may alter its mother's behavior causing her to check her infant more frequently for pacifier loss.^{17,18,20,21,22.}

Several causal mechanisms have been proposed to explain the finding of a negative association between pacifier use and the risk of SIDS, including the following: the presence of a pacifier may protect the infant's airway,^{2,9,12} pacifier sucking, or just the presence of a pacifier, may lessen the likelihood of apnoea⁸; and pacifier use may reduce high risk infant sleep behaviours, such as a prone sleeping position.^{2,9} Most researchers and clinicians, however, are reluctant to actively promote the use of pacifiers in the absence of adequate knowledge regarding actual mechanisms related to pacifier use and SIDS.

5. Recommendations

Before a recommendation can be made to promote the use of pacifiers to reduce the risk of SIDS, it is important to review the associated risks of pacifier usage. Research has shown that pacifiers have been linked to reduced rates of breastfeeding, duration of feeding, increased risk of acute otitis media, and dental problems.¹³

Dental Issues -The sucking of pacifiers, fingers and thumbs has been shown to lead to dental problems such as overbites, open-bites and cross-bites.^{23,24} The impact of pacifier use and finger-sucking is associated with posterior lateral cross-bite which disappears by the age of 9 years.²⁵ In Greece, a survey of 5-year-olds showed that only 3.4 percent of 5-year-olds were still using a pacifier while 80 percent of finger suckers were still sucking on their fingers. The authors concluded from this study that pacifiers can have a preventive effect against finger sucking, which is more harmful to dentition than pacifiers.²⁴ The *American Academy of Pediatric Dentists* (AAPD) states that all types of Non Nutritive sucking impact teeth in the same way, but pacifiers are an easier habit to break compared to finger or thumb sucking. According to the AAPD, Non Nutritive sucking is

not a problem for teeth unless it continues after the child's permanent teeth have come in.

Breastfeeding - During the 1990s, the World Health Organization/United Nations Children's Fund Baby Friendly Hospital Initiative discouraged the use and offering of pacifiers to mothers because of the belief that pacifier use interfered with breastfeeding. The use of pacifiers and the impact on the start and duration of breastfeeding has been studied in England, Brazil, Sweden, New Zealand and the United States and these observational studies have found that pacifier use tends to reduce the duration of breastfeeding before infants are weaned and reduce the initiation of breastfeeding. The two major theories explaining why the use of a pacifier may impact breastfeeding include nipple confusion and reduced sucking time. Reduced sucking time on the breast results in a lowered milk supply which may encourage earlier weaning. As no physiological evidence exists that infants actually experience nipple confusion, it is most likely that the pacifier use results in decreased sucking time.^{25-29.}

Acute Otitis Media (AOM) | Research studies have shown that pacifier use is associated with acute otitis media (AOM). Common symptoms of AOM include night restlessness, poor appetite, vomiting, earache and cough. AOM is closely related to viral respiratory infections and the incidence is highest in children less than 2 years of age and the peak incidence is between 6 and 12 months of age. Breastfeeding has found to have protective against AOM and infants who are breastfeed for at least four months have 50 percent fewer occurrences of AOM. Supine sleep position has also been found to be protective against AOM.

The potential detrimental effects of pacifier use recommend that pacifier usage should be of limited duration. Pacifiers should be introduced only after breastfeeding has been well established, which is consistent with the AAP policy statement on breastfeeding. Because SIDS is less common in the first month of life, it is sensible to delay pacifier introduction during this lower risk period. The pacifier must not be used as a substitute for nursing or feeding, nor it be coated with sugar, honey, or any other sweet substances. Once the infant sleeps, the pacifier should not be reintroduced if it falls out of the mouth, nor forced use is recommended. We recommend cessation of pacifier use by 12 months of age, because otitis media risk is higher, whereas SIDS risk declines considerably after this age. The risk of otitis media associated with pacifier use may be reduced by frequent cleaning and replacement of damaged pacifiers. Medical professionals should alert parents of infants about these practices. To ensure maximal breastfeeding success, mothers need regular support, encouragement, and assistance while developing proper breastfeeding techniques to build confidence in breastfeeding, because these qualities have been observed in mothers who give pacifiers to their infants and continue breastfeeding.

It is important to highlight that the association does not necessarily imply that the use of a pacifier is "protective" against SIDS, although the finding is compatible with this hypothesis. Even with a large and careful case control study,

we cannot be sure that parents of victims of SIDS who use a pacifier are not systematically different in some unmeasured way from the controls.³⁰

6. Conclusion

The review of literature suggested that the use of pacifier has lead to decrease in the incidence of SIDS but though the cause of SIDS is unknown, immature cardiorespiratory autonomic control and failure of arousal responsiveness from sleep are also important factors. More research needs to be carried out to prove the association of the use of pacifier and its usefulness in preventing SIDS. Additionally the pros and cons of the use of pacifier in children have also to be weighed and the use of pacifier must be made with proper medical guidance.

References

- [1] Willinger M, James LS, Catz C. Defining the sudden infant death syndrome (SIDS): deliberations of an expert panel convened by the National Institute of Child Health and Human Development. *Pediatr Pathol.*1991;11:677-684.
- [2] Mitchell EA, Taylor BJ, Ford RP, Stewart AW, Beecroft DM, Thompson JM, et al. Dummies and the sudden infant death syndrome. *Archives of Disease in Childhood.* 1993;68(4):501-504.
- [3] Carpenter RG, Irgens LM, Blair PS, et al. Sudden unexplained infant death in 20 regions in Europe: case control study. *Lancet.*2004;363:185-191
- [4] Fleming P, Blair P, Pollard K, et al. Pacifier use and sudden infant death syndrome: results from the CESDI/SUDI case control study. *CESDI SUDI Research Team. Arch Dis Child.* 1999;81:112-116
- [5] Hauck FR, Herman SM, Donovan M, et al. Sleep environment and the risk of sudden infant death syndrome in an urban population: the Chicago Infant Mortality Study. *Pediatrics.* 2003;111:1207-1214
- [6] McGarvey C, McDonnell M, Chong A, O'Regan M, Matthews T. Factors relating to the infant's last sleep environment in sudden infant death syndrome in the Republic of Ireland. *Arch Dis Child.* 2003;88:1058-1064
- [7] Tappin D, Brooke H, Ecob R, Gibson A. Used infant mattresses and sudden infant death syndrome in Scotland: case-control study. *BMJ.* 2002;325:1007-1009
- [8] Arnestad M, Andersen M, Rognum TO. Is the use of dummy or carry-cot of importance for sudden infant death? *Eur J Pediatr.*1997;156:968-970
- [9] L'Hoir MP, Engelberts AC, van Well GTJ, et al. Dummy use, thumb sucking, mouth breathing and cot death. *Eur J Pediatr.*1999;158:896-901
- [10] Vennemann MM, Martina F, Trude B, et al. Modifiable risk factors for SIDS in Germany: results of GeSID. *Acta Paediatr.*2005;94:655-660
- [11] Li DK, Willinger M, Petitti DB, Odouli R, Liu L, Hoffman HJ. Use of a dummy (pacifier) during sleep and risk of sudden infant death syndrome (SIDS):

- population based case-control study. *BMJ*. 2006 ;332:18-22
- [12] Cozzi F, Morini F. Possible mechanisms of pacifier protection against SIDS. *Journal of Pediatrics*. 2001;138(5):783-4.
- [13] Adair SM. Pacifier Use in Children: A review of Recent Literature. *Pediatric Dentistry* 2003; 25(5):449-58.
- [14] Hauck FR Etal *Pediatrics* electronic pages November 2005 Volume 116 No 5 page e716
- [15] McVea KL, Turner PD, Pepler DK. The role of breastfeeding in sudden infant death syndrome. *Journal of Human Lactation*. 2000;16(1):13-20.
- [16] Scragg RK, Mitchell EA, Stewart AW, Ford RP, Taylor BJ, Hassall IB. Infant-room sharing and prone sleep position in sudden infant death syndrome. *Lancet*. 1996;347:7-1.
- [17] World Health Organisation. The Innocenti Declaration: Progress and achievements Part 1. *Weekly Epidemiological Record* 1998:25-32.
- [18] World Health Organisation. The Innocenti Declaration: Progress and achievements Part 11. *Weekly Epidemiological Record* 1998:91-94.
- [19] Franco P, Scaillet S, Wermenbol V, et al. 2000. The influence of a pacifier on infant arousals from sleep. *The Journal of Pediatrics* 136;6:775-779.
- [20] World Health Organisation. The Innocenti Declaration: Progress and achievements Part 111. *Weekly Epidemiological Record* 1998;73(19):139-144.
- [21] Callaghan A, Read A. Pacifier use in Western Australia [Honours thesis]. Perth: Edith Cowen University; 1998.
- [22] World Health Organisation. The Baby-friendly Hospital Initiative. Monitoring and reassessment: Tools to sustain progress. Geneva: World Health Organisation, United Nations Children's Fund, and Wellstart International; 1999.
- [23] Vadiakas G, Oulis C, Berdouses E. Profile of non-nutritive sucking habits in relation to nursing behavior in pre-school children. *Journal of Clinical Pediatric Dentistry*. 1998;22:133-136.
- [24] Larsson E, 1971 Dummy and finger-sucking habits with special attention to their significant for facial growth and occlusion. *Swed. Dent. Journal* 1972 65;605.
- [25] Righard L, Alade MO. Breastfeeding and the use of pacifiers. *Birth*. 1997; 24:116-120.
- [26] Aarts C, Hornell A, Kryberg E, et al. The influence of a pacifier on infants' arousals from sleep. *J Pediatr*. 2000;136:775-779.
- [27] Riva E, BanderaliG, Agostini C, et al. Factors associated with initiation of duration of breastfeeding in Italy. *Acta Paediatr Scand*. 1999;88:411-415.
- [28] Kloeblln-Tanver AS. Pacifier use is associated with shorter breastfeeding duration among low-income women. *Paediatrics*. 2001;108:526.
- [29] Clements MS, Mitchell EA, Wright SP, et al. Influences on breastfeeding in southeast England. *Acta Paediatr Scand*. 1997;86:51-56.
- [30] Otitis Media: Review of the literature p1-12. <http://herkules.oulu.fi/isbn9514252314/html/c212.html>.