

## Review Article

# Breast Feeding Associated with Reduced Sudden Infant Death Syndrome and Infant Mortality

Raymond Shamberger\*

King James Medical Laboratory, USA

## \*Corresponding authors

Raymond Shamberger, King James Medical Laboratory, 24700 Center Ridge Rd, Cleveland, Ohio 444145, USA, Tel: 001-440-835-2150; Fax: 001-440-835-2177; Email: Bobray@ameritech.net

Submitted: 09 April 2014

Accepted: 27 May 2014

Published: 29 May 2014

ISSN: 2333-6439

Copyright

© 2014 Shamberger

OPEN ACCESS

**Abstract**

**Objective:** The cause of SIDS is unknown. The American Academy of Pediatrics as a result of case-control studies has recommended that mother's breast feed their children as a new step in SIDS prevention. The objective of this study is to apply nutritional epidemiology to SIDS, infant mortality, and breast feeding in the States of America and the counties of Florida to further confirm this observation.

**Study design:** The rates of SIDS and infant mortality, and the 3 month exclusive breastfeeding are known for 2007. These rates, as well as several ecological factors, were compared using Excel statistics. Patterns between diseases were also observed. Similar statistics for infant mortality deaths were also done for the State of Florida using results from women who initiated breast feeding their babies after birth.

**Results:** Rates of SIDS, and infant mortality were inversely significantly associated with 3 month exclusive breast feeding in the United States. Similar results were also seen for infant mortality in the counties of Florida. Patterns of relationships between SIDS, infant mortality and other factors may indicate a similarity in the origins of the diseases.

**Conclusion:** Nutritional epidemiology of SIDS, and infant mortality in the United States and the counties of Florida in regard to infant mortality show that breast feedings may prevent these diseases as previously found in case-control studies.

Comparison to other ecological factors suggests that the SIDS and infant mortality diseases may be similar in origin except for the severity of the diseases.

**ABBREVIATIONS**

SIDS: Sudden infant death syndrome. Unexplained death of an infant under 1 year; SUIDS: Sudden unexplained infant deaths caused by metabolic disorders; Hypothermia; Hyperthermia; Neglect; Homicide or accidental poisoning; Nutritional epidemiology: New field of medical research that studies relations between nutrition and health; Infant mortality: Rate of infant deaths during the first year after live birth

**INTRODUCTION**

SIDS is the sudden unexpected death of a apparently healthy infant and is unexplained after an autopsy. SIDS is the number one cause of deaths among infants between the ages of 1 week and 1 year, but is mostly found to occur between the ages of 2 to 4 months.

SIDS causes about 1500 infant deaths each year. The number of deaths has been steady for about 14 years. Prior to the placing of babies on their backs the number of deaths was about 3000

year. The major credit for the 1994 "Back to sleep" was the recommendation by the American Academy of Pediatrics that infants be placed for sleep in a non-prone position. Between 1994 and 2001 the United States SIDS rate declined from 120 deaths to 50 per 100,000 (Figure 1). However, the rate remained constant from 2001 to 2006. Rates for Non-Hispanic blacks and American Indian/Alaska Native remain disproportionately higher than the rest of the population. Sudden unexpected infant deaths (SUID), also known as sudden expected death in infancy, is a term used to describe any sudden and unexpected death (including SIDS), that occurs during infancy. After case investigation, SUIDS can be attributed to suffocation, asphyxia, entrapment, regurgitations, infections, ingestions, metabolic diseases, and trauma. If an autopsy cannot determine the cause of death, then a scene investigation or a review of clinical history is needed. Sometimes specialized investigations show metabolic disorders or arrhythmia-associated cardiac myopathies.

To monitor trends in SIDS and other SUID nationally, the United States uses the International Classification of Diseases

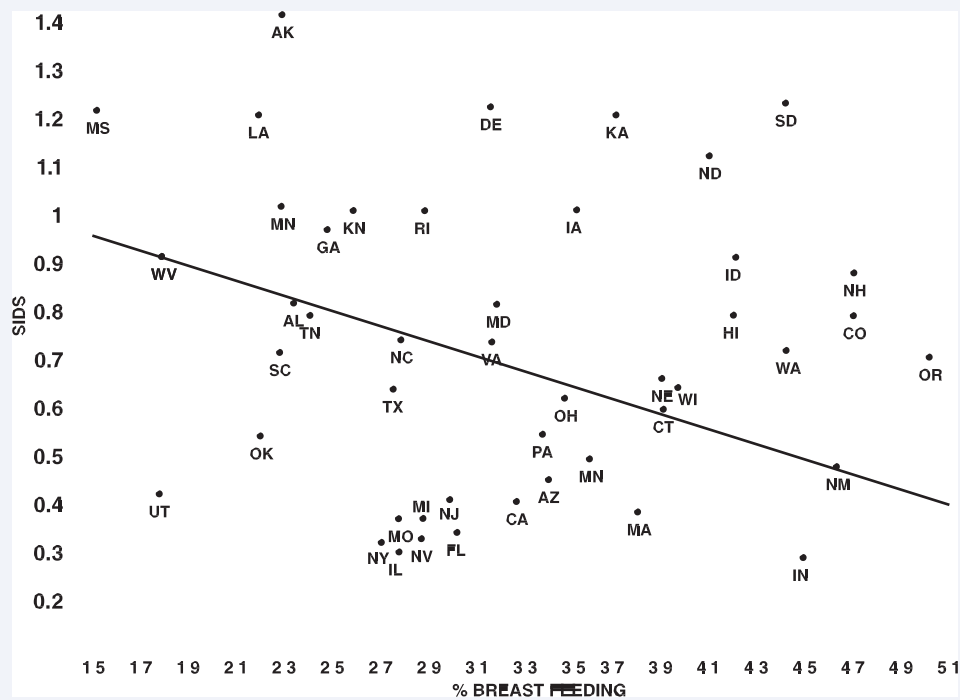


Figure 1 SIDS rate (14) per 1000 births by state and breast feeding percentage.

(ICD) diagnostic codes. The National Center for Disease Statistics assigns a SIDS diagnostic code (ICD-10 R95).

The Task Force on Sudden Infant Death Syndrome expanded its recommendation for a safe infant sleeping environment. Breast feeding was added to their list [1]. Breastfeeding has been associated with a reduced risk of SIDS. Vennemann [2] did a case control meta- analysis study in Germany.

This study compared 333 infants who died of SIDS to 998 age-matched controls. Both partial and exclusive breast feeding reduced the risk of SIDS. Hauck [3] also did a case-control study which identified 286 studies on breastfeeding from 1966-2009 and utilized 18 of them which met basic research quality. The results of the meta-analysis study showed that in infants who receive any breast milk for any duration, the likelihood of SIDS was 60% lower, infants who were partially breast fed had a 62% less risk, and those exclusively breast fed showed a 73% lower risk. However, none of the studies included in the meta-analysis were experimental and the designs of the experiments did not include randomization.

Low birth weight, premature birth and teenage mothers were directly associated with a greater risk from SIDS. In a study of low birth weight babies in the United States from 1995-98, the SIDS death rates for infants weighing 1000-1499 g was 2.89/1000, but for a birth weight of 3500-3999 the death rate was only 0.5/1000 [4]. The increased risk of SIDS in infants born prematurely is almost fourfold [5]. Some of these comparative ecological parameters is included in (Table 1). SIDS rates decrease with internal maternal age with teenage mothers at the greatest risk. Delayed or inadequate prenatal care and exposure to nicotine from maternal smoking also cause SIDS rates to be greater [6,7].

Normal development of cells critical for infant development may be affected by these situations. These conditions could directly increase the risk of SIDS, or could be an indirect association because of an underlying biological or environmental risk factor common to both conditions.

SIDS may coincide with a delay in the development of nerve cells that produce serotonin which is important for normal heart and lung function. Serotonin is a brain chemical that conveys messages between cells and plays a vital role in regulating breathing, heart rate and sleep. Serotonin was 26% lower in children who died of SIDS. Measurement of tryptophan hydrolase needed to make serotonin was also 22% per cent lower [8]. The decreased serotonin may reduce an infant's ability to respond to breathing challenges such as low oxygen levels or high levels of carbon dioxide which accumulate in bedding while face down. An infant with a normal brainstem function would turn his head or wake up in response to these abnormal levels.

Novel mutations in the cardiac sodium or potassium channel genes that result in a long QT syndrome as well in other genes that

Table 1: Relationships between SIDS Deaths and Some Ecological Parameters or Disease in 2007 in the 50 States of the United States.

Parameter	SIDS	Probability	P< Ref
Breast feeding 3 mo	-0.581	0.0001*	
Premature birth	0.351	0.02	[16]
Low birth weight	0.488	0.001	[17]
Very low birth weight	0.649	0.0001*	[18]
Obesity	0.601	0.0001*	[19]
Poverty	0.403	0.01	[21]
Per capita income	-0.318	0.05	[22]

\* Extrapolated beyond statistics table.

regulate channel function are found in about 5% to 10% of infants who die from SIDS [9]. The identifications of polymorphisms such as specific Scn5a (sodium channel gene) Beta subunits present in SIDS pathogenesis lends support that a genetic predisposition contributes to the etiology of SIDS [10]. However, other under development of critical systems also associated with SIDS could be a significant factor.

The neonatal period includes the number of deaths in the first month. This period is a highly vulnerable time for an infant who is completing many of the physiologic adjustments required for extra-uterine existence. Neonatal mortality is influenced by medical, socio-economic and cultural factors. Breast feeding promotes maturation of the digestive tract and protects against infection. The greater the delay between birth and breast feeding, the greater the Likelihood that infants will die in underdeveloped countries before they are 4 weeks old.

Common bacterial infections such as Staphylococcus aureus and Escherichia coli appear to be risk factors in some cases of SIDS. Both bacteria were present in some cases of SIDS and were present in greater than usual concentrations in infants who died from SIDS [11]. SIDS cases peak between eight and ten weeks after birth, a time when antibodies that have been passed from mother to child and are starting to disappear, but have not been replenished by the infants own antibodies. Mold can cause bleeding in the lungs and other uncommon places that may be fatal. The presence of mold correlates positively with increased incidence of SIDS [12]. Mold related illness is often misdiagnosed as a virus, influenza and or asthma-like condition.

Chen and Rogers [13] studied 1204 infants and have evaluated the effect of breast feeding on postnatal mortality in the United States using National Maternal and Infant Health Survey (NMIHS) data. Children who were breast fed had a 0.79 risk ratio versus the risk of never breast fed children for dying in the post neonatal period.

The objective of this study is to apply nutritional epidemiology to exclusive breast feeding and SIDS to see if there is a relationship to the SIDS rate or the one year infant mortality and to see if interrelationships might exist between SIDS, and the first year infant mortality.

## MATERIAL AND METHODS

The 2007 SIDS death rates were obtained from a CDC Wonder Site for 46 states [14]. Data from four states was too small to be significant. The four states were Alaska, Maine, Vermont and Wyoming.

The 2007 SIDS rates were compared to the breast feeding rates [15] for each of 46 states (Table 1). Statistical comparisons were done using EXCEL statistics. Most correlation tables end at  $P < 0.001$ . However, an xy graph can be constructed showing points beyond  $P < 0.001$ . These states were also compared to various ecologic parameters in these states. These include premature births [16], low birth weights [17] very low birth weights [18] maternal obesity [19], Infant mortality and neonatal mortality [20], children in poverty [21], and per capita income [22].

The results using 46 states were included in the first column of (Table 1). All other comparisons were done with 50 states.

Some of the SIDS and ecologic results in regard to premature births, low birth rates, and very low birth weights, poverty and obesity seem to be similar in their relationship to SIDS. Breast feeding also was related to infant mortality in the 50 states [23].

The infant mortality rate by county has been posted by Florida. Results were averaged for the years 2010-2012 [24] Breast feeding data has been gathered from birth certificates on the self-reported "initiation of breastfeeding" [25]. The latest year available was 2012. The county SIDS rate and the infant mortality data and the intent to breast feed data were also analyzed. Florida has 67 counties. The number of counties and their match-ups to the two diseases are listed in the results.

## RESULTS

The five states with the highest 2007 SIDS rates were Arkansas, Louisiana, South Dakota, Delaware and Mississippi. The states with the lowest SIDS rates were Utah, New York, Nevada, Illinois and California. Table 1 shows a strong inverse relationship between the 2007 SIDS and the three month breast feeding in the 46 states,  $R = -0.581$ ,  $P < 1 \times 10^{-4}$ .

Premature birth rate, low birth rate, obesity, and infant deaths were all strongly directly related to SIDS, (Table 1) Because of the very similar relationships of SIDS, and infant deaths and the ecological factors, perhaps these diseases are closely related.

Comparisons of Florida counties were made between the intention of breast feeding and the Florida rates of infant mortality  $R = -0.436$ ,  $P < 0.001$  and the SIDS rate from 2003-2012 were also compared in the same way. However, the numbers were too small for a statistical comparison.

## DISCUSSION

The cause of SIDS is unknown, not predicted by medical history and occurs without warning. One popular theory is that the baby has a problem with waking up (sleep arousal) caused by inability of the baby's body to detect a buildup of carbon dioxide. Breast fed babies are more easily aroused than formula-fed infants which may be an alternative mechanism for the protective effect against SIDS.

Breast feeding may promote maturation of the digestive tract and protect against infection. The longer the delay from birth, the greater the likelihood that infants will die in underdeveloped countries before they are four weeks old. Neonatal mortality is influenced by medical, socioeconomic and cultural factors.

SIDS cases peak between eight and ten weeks from birth, a time when antibodies from mother to child are starting to disappear, but have not been replenished by the infant's own antibodies.

Plasma 25-hydroxyvitamin D levels were measured in 41 post mortem cases of SIDS. Twenty-six had moderate to severe deficiency of the vitamin. Rib histology was abnormal in 69% of cases which had inadequate vitamin D levels.

Breast fed babies have a decreased occurrence of respiratory and gastrointestinal infections. The case control studies of Hauck [3] and Vennerman [4] show that breast fed babies have a lower SIDS rate than formula fed babies. Their studies led to a

recommendation by the American Academy of Pediatrics [1] that breast feeding be added to their infant care guidelines.

The type of study done in this research report is based on nutritional epidemiology. The advantages of this type of research are that the entire country or state can be used. Differences between states can lead to inferences about the cause of the disease.

There was a strong inverse relationship between SIDS and breastfeeding in 46 states. Counties in the state of Florida also show a strong inverse relationship between breast feeding and SIDS.

The initiation of breastfeeding is not as good a statistic as exclusive breast feeding. However, it is likely that many of the mothers after initiation would continue breast feeding. Even a small amount of breast feeding would help reduce the progression to SIDS in the first two critical months [3,4].

Because of the similarities between SIDS and infant mortality and several ecological factors in (Table 1), the diseases could be very similar, but only differing in their intensity and timing. SIDS which peaks in mortality at two months could be the most lethal form followed by infant mortality which has mortality by one year. SIDS death rates may be related because they are part of the infant mortality statistics. Finally, both diseases are protected by breast feeding and relate to several other ecologic factors in (Table 1) in a similar manner.

## REFERENCES

1. Task Force on Sudden Infant Death Syndrome, Moon RY. SIDS and other sleep-related infant deaths: expansion of recommendations for a safe infant sleeping environment. *Pediatrics*. 2011; 128: 1030-1039.
2. Vennerman MM, Bajanowski B, Brinkmann B, Jorch G, Yucesan K, Sauerland C, et al. Does breastfeeding reduce the risk of sudden infant death syndrome? *Pediatrics*. 2009; 123: e406-e410.
3. Hauck FR, Thompson JM, Tanabe KO, Moon RY, Vennemann MM. Breastfeeding and reduced risk of sudden infant death syndrome: a meta-analysis. *Pediatrics*. 2011; 128: 103-110.
4. Hunt CE. Small for gestational age infants and sudden infant death syndrome: a confluence of complex conditions. *Arch Dis Child Fetal Neonatal Ed*. 2007; 92: F428-429.
5. Sullivan FM, Barlow SM. Review of risk factors for sudden infant death syndrome. *Paediatr Perinat Epidemiol*. 2001; 15: 144-200.
6. Lavezzi AM, Corna MF, Matum L. Ependymal alterations in sudden intrauterine unexplained death syndrome: possible primary consequence of prenatal exposure to cigarette smoking. *Neural Dev*. 2010; 19: 17.
7. Chong DS, Yip PS, Karlberg J. Maternal smoking: an increasing unique risk factor for sudden infant death syndrome in Sweden. *Acta Paediatr*. 2004; 93: 471-478.
8. Duncan JR, Paterson DS, Hoffman JM, Mokler DJ, Borenstein NS, Belliveau RA, et al. Brainstem serotonergic deficiency in sudden infant death syndrome. *JAMA*. 2010; 303: 430-437.
9. Weese-Mayer DE, Ackerman MJ, Marazita ML, Berry-Kravis EM. Sudden Infant Death Syndrome: review of implicated genetic factors. *Am J Med Genet A*. 2007; 143A: 771-788.
10. Tan BH, Pundi KN, Van Norstrand DW, Valdivia CR, Tester DJ, Medeiros-Domingo A, et al. Sudden infant death syndrome-associated mutations in the sodium channel beta subunits. *Heart Rhythm*. 2010; 7: 771-778.
11. Weber MA, Klein NJ, Hartley JC, Lock PE, Malone M, Sebire NJ. Infection and sudden unexpected death in infancy: a systematic retrospective case review. *Lancet*. 2008; 371: 1848-1853.
12. Weinberg ED. Association of primary *Pneumocystis carinii* infection and sudden infant death syndrome. *Clin Infect Dis*. 2000; 30: 991.
13. Chen A, Rogan WJ. Breastfeeding and the risk of postneonatal death in the United States. *Pediatrics*. 2004; 113: e435-439.
14. The 2007 SIDS death rates in the United States.
15. CDC-breast feeding and statistics. National Immunization Survey Centers for Disease Control and Prevention. Department of Health and Human Services, Atlanta, Georgia. 2007.
16. Kung HC, Hayert DL, Xu JQ, Murphy SL. HRSA (U.S. Department of Health and Human Services Administration) Child Health USA. Data for 2005. National Vital Statistics reports. Hyattsville. 2007; 56.
17. National Kids Count Program. Low-birth weight babies (%) -2007.
18. National Kids Count Program: Very low-birthweight babies (%) -2007.
19. Centers for Disease Control and Prevention: Obesity.
20. National Kids Count Program: Infant Mortality and Neonatal mortality (%) -2007.
21. National Kids Count Program: Poverty (%) - 2007.
22. United States Census. Per capita income. Washington, D.C. US Department of Commerce, 2007.
23. The Florida Department of Health. CHARTS: Infant Death Indicator Viewer. 2011.
24. Family Health Services edoh.state.fl.us. Florida Birth Query System. Births, count and breast feeding initiation. 2011.
25. Cohen MC, Offiah A, Sprigg A, Al-Adnani M. Vitamin D deficiency and sudden unexpected death in infancy and childhood: a cohort study. *Pediatr Dev Pathol*. 2013; 16: 292-300.

### Cite this article

Shamberger R (2014) Breast Feeding Associated with Reduced Sudden Infant Death Syndrome and Infant Mortality. *Med J Obstet Gynecol* 2(1): 1021.