SUDDEN INFANT DEATH SYNDROME: A REVIEW

Suvarna A. Gohane¹*, Dr. S. B. Kosalge², Smita M. Meshram³

¹*,³ Asst. Prof, ²Principal
HI-tech College of Pharmacy, Chandrapur-442401, India.

ABSTRACT

Sudden infant death syndrome (SIDS) has been the focus of extensive research over the past several decades. Sudden infant deaths in infancy (SID) represent the commonest group of post-neonatal childhood deaths. The identification of specific medical causes of death at autopsy in SID has slightly improved in recent years, but around two-thirds of cases remain unexplained, being classified as SIDS, the diagnosis is based on a thorough death scene investigation, autopsy, review of infant’s and family’s medical records and histories. The aim of this article is to review the current evidence for protocols of post-mortem investigations of SID, with particular emphasis on features which include characteristics, reporting causes, prevention, diagnosis and how to reduce the risk factors. The article will not discuss issues related to non-accidental or inflicted injury, which remain complex and beyond the scope of this review.

KEYWORDS: Sudden infant death, SIDS, Autopsy, Post-mortem investigation.

INTRODUCTION

Sudden infant death syndrome (SIDS) continues to be a devastating form of post neonatal death. The term Cot Death was coined in 1954 to describe sudden unexpected infant deaths that occur for no obvious reason. Such deaths have occurred throughout the ages but have become the major cause of post neonatal infant mortality as other causes of infant death have declined. In 1969 the term Sudden Infant Death Syndrome (SIDS) was proposed to describe those which remain unexplained after a postmortem examination. The terms are often used interchangeably and were gradually adopted after they were accepted as a registrable cause of natural death by the Coroner’s Society and the Registrar General in England and Wales in autumn 1970. Because Sudden Infant Deaths were only identifiable in published national
statistics from 1971 onwards and there was gradual diagnostic transfer to the new terminology, the combined rate for deaths certified by a coroner as a Sudden Respiratory Death occurring at home (SRDh) or as a Sudden Infant Death (SID) gives the most accurate measure of the scale of the cot death problem in the 1970s and ‘80s.\[1\]

In response to great public concern, the CMO, on 30 November 1994, announced the setting up of an Expert Group to investigate Cot Death Theories (Expert Group) to be chaired by Lady Limerick. The terms of reference were to review the findings of the report ‘Sudden Infant Death Syndrome’s and any subsequent data on hypotheses linking antimony with unexplained deaths in infants; and to advise the CMO on what further studies should be undertaken to investigate postulated causal relationships between chemicals and cot deaths. The twelve member Expert Group met first on 16 December 1994 and on a further 23 occasions.\[2\]

Yet, infants still succumb to this syndrome which leaves practitioners continually looking for ways to further reduce or even eliminate the incidence of SIDS. Research continues to identify new potential risk factors. This paper summarizes the about SIDS, symptoms, causes, prevention and other factors related to sudden infant death syndrome.\[3\]

**SIDS**

Also referred to as crib or cot death, SIDS has been defined by the National Institutes of Health Consensus Development Conference on Infantile Apnea and Home Monitoring as “the sudden death of an infant or young child, which is unexplained by history and in which a thorough postmortem evaluation fails to demonstrate an adequate cause of death.” A thorough postmortem evaluation includes a complete autopsy, review of the death scene, and review of the clinical history.\[4\] The consensus statement defined an apparent life-threatening event (ALTE) as “an episode that is frightening to the observer and is characterized by some combination of apnea, color change, change in muscle tone, choking, or gagging.” It is noted in this statement that terminology used previously, such as “aborted crib death” or “near-miss SIDS,” should be abandoned because it implies a possibly misleadingly close association between this type of spell and SIDS. Apnea of infancy is defined as an unexplained episode of cessation of breathing for 20 seconds or longer or a shorter respiratory pause associated with bradycardia, cyanosis, pallor, or marked hypotonia. This generally is applied to infants who are older than 37 weeks’ gestation. This diagnosis usually is reserved for infants who
have ALTE for which a specific cause has not been delineated that is believed to have been related to apnea.[5]

**Characteristics of SIDS**

SIDS is unexpected, usually occurring in healthy appearing infants under 1 year of age. A SIDS death occurs quickly and usually during sleep. SIDS is rare during the first month of life. Although SIDS can occur in older infants, most SIDS deaths occur by the end of the sixth month, with the greatest number occurring in infants between 2 and 4 months of age.

In the United States, more SIDS cases are reported in the fall and winter than in spring or summer. SIDS occurs more often in boys than in girls (approximately a 60- to 40-percent male-to-female ratio). African-American and American-Indian infants are two to three times more likely to die from SIDS as other infants.[6]

**How many babies die from SIDS**

Approximately 3,000 babies die of SIDS each year. Even though doctors and nurses still don’t know what causes SIDS, they do know:

- Most SIDS deaths occur when a baby is between 2 and 4 months of age.
- African American babies are twice as likely to die of SIDS as white babies.
- More boys die of SIDS than girls.
- A SIDS death happens quickly, with no signs of suffering.
- More SIDS deaths occur in the colder months.[7-8]

**Reporting causes of death**

The exact cause or causes of SIDS are yet unknown by medical science. Promising research currently is being done in the areas of immunology, infection, neurology and in the mechanisms that regulate the heart and respiration. In spite of all the research, we do not know what causes SIDS and we cannot predict which babies will die.

Mounting evidence suggests that some SIDS babies are born with brain abnormalities that make them vulnerable to sudden death in infancy. Many scientists believe that these abnormalities present at birth may not be sufficient to cause death by themselves, but may make the infant more vulnerable at a critical point in development. Other events occurring after birth may trigger the SIDS reaction.[9]
SIDS is a diagnosis of exclusion, meaning all other reasonable causes must be ruled out before a death is labeled SIDS. Diseases or conditions that have known markers or causes are ruled out through autopsy findings, a death scene investigation and a thorough review of the victim’s and family’s health history.

**While the cause of SIDS remains unknown, we do know.**

- SIDS is not caused by immunizations, apnea, child abuse or suffocation
- SIDS is not communicable
- Cardiac and respiratory monitoring does not prevent SIDS
- SIDS is not the result of any action of the parents or caregivers
- Because the first symptom of SIDS is the sudden death, it is not predictable.\(^\text{[10]}\)

**Prevention**

**Infants placed on their backs to sleep, for every sleep, have a reduced risk of SIDS.**

Prone and lateral sleeping positions are linked to increased rates of SIDS, even for infants who regurgitate. Infants who normally sleep on their backs and are then placed to sleep on their stomachs are at a particularly high risk. This reinforces the importance to consistently place infants on their backs to sleep at home, in child care settings, and when travelling. Sleep positioners or any other infant sleep positioning devices should not be used as they pose a risk of suffocation. Once infants are able to roll from their backs to their stomachs or sides, it is not necessary to reposition them onto their backs.

Infants will benefit from supervised tummy time, when they are awake, several times every day, to counteract any effects of regular back sleeping on muscle development or the chance of developing plagiocephaly, commonly referred to as flat head.

**Preventing exposure to tobacco smoke, before and after birth, reduces the risk of SIDS.**

Maternal smoking during pregnancy is an important risk factor for SIDS. The more a woman smokes during pregnancy, the higher the risk of SIDS. Women who reduce the amount of cigarettes smoked during pregnancy can reduce the risk of SIDS for their infants, and women who stop smoking can further reduce the risk. It is estimated that one third of all SIDS deaths could be prevented if maternal smoking was eliminated.

Infants who are exposed to second-hand smoke after birth are also at a greater risk of SIDS, and the risk increases with the level of exposure.
The safest place for an infant to sleep is in a crib, cradle, or bassinet that meets current Canadian regulations.

When infants sleep on surfaces that are not designed for them, such as adult beds, sofas, and armchairs, they are more likely to become trapped and suffocate, in particular when the surface is shared with an adult or another child. Other than a firm mattress and a fitted sheet, there is no need for any extra items in a crib, cradle, or bassinet. Soft bedding such as pillows, duvets, quilts and comforters, as well as bumper pads increase the risk of suffocation.

Overheating is a risk factor for SIDS. Infants are safest when placed to sleep in fitted one-piece sleepwear that is comfortable at room temperature and does not cause them to overheat. Infants do not require additional blankets as infants’ movements may cause their heads to become completely covered and cause them to overheat. If a blanket is needed, infants are safest with a thin, lightweight, and breathable blanket.

Strollers, swings, bouncers, and car seats are not intended for infant sleep. When sleeping in the sitting position, an infant’s head can fall forward and their airway can be constricted. This risk reinforces the importance to move an infant to a crib, cradle, or bassinet to sleep, or when the destination is reached.

**Infants who share a room with a parent or caregiver have a lower risk of SIDS.**

Room sharing refers to a sleeping arrangement where an infant’s crib, cradle, or bassinet is placed in the same room and near the parent or caregiver’s bed. Infants who share a room have a lower risk of SIDS and will benefit from room sharing for the first 6 months during the period of time the risk of SIDS is highest. Room sharing facilitates breastfeeding and frequent contact with infants at night.

Bed sharing describes a sleeping arrangement where an infant shares a sleeping surface such as an adult bed, sofa, or armchair with an adult or another child. Sharing a sleeping surface increases the risk of SIDS and the risk is particularly high for infants less than 4 months of age. Sharing a sleeping surface with an infant also increases the risk of entrapment, overheating, overlaying, and suffocation. The risk of SIDS and other unintentional deaths that occur during sleep increase further when an infant shares a sleeping surface with a parent or caregiver who smokes, has consumed alcohol, is under the influence of sedating drugs, or is overly tired.[11]
**Diagnosis**

By definition, a SIDS diagnosis requires a complete autopsy, a thorough death scene investigation, and a clinical history. A death is diagnosed as SIDS only after all probable alternatives have been eliminated—in other words, SIDS is a diagnosis of “exclusion.” Often, the cause of an infant death can be determined only through a process of collecting information; conducting sometimes complex forensic tests; and by talking with parents, other caregivers, and physicians.

**Medical and legal experts rely on three methods to determine a SIDS death.**

1. a thorough death scene investigation
2. autopsy
3. review of infant’s and family’s medical records and histories.\(^{[12]}\)

When a death is sudden and unexplained, investigators, including medical examiners and coroners, call on forensic experts, who apply their expertise in medicine and the law to help determine a cause of death. SIDS is no exception.

In most cases, the death investigation is led by the medical examiner or coroner for the county, district, or State in which the death occurred. Deaths suspected to be SIDS usually require law enforcement officers to conduct a thorough death scene investigation. The medical examiner/coroner gathers information from the death scene and case histories and presents this information to the pathologist (usually board certified or with credentials in forensic pathology). The pathologist conducts or supervises the autopsy and assesses results of the autopsy, death scene investigation, and case histories to determine whether a SIDS death has occurred. The pathologist issues a SIDS diagnosis when there is no other apparent cause for the infant’s death.

**A Thorough Death Scene Investigation**

Although it may be emotionally painful for the family, a death scene investigation will help shed light on the cause of death by providing a detailed record of the location and circumstances of the death. Therefore, the investigator will attempt to learn as much as possible about the events leading up to the death, even the very moment that the death occurred.
The Centers for Disease Control and Prevention (CDC) have developed guidelines for death scene investigation of a sudden, unexplained infant death (CDC, 1996). Local jurisdictions may use these guidelines or develop their own protocols for investigating sudden unexpected infant death.

Investigators will interview the parent or other individual who was caring for the child at the time of the death, as well as any other family members or adults who were present at the time of the death or before the death occurred. The investigator will ask open ended, neutral questions such as, “Can you tell me what happened?” “How old was the baby?” “What did the baby weigh?” “What time was the baby put to bed?” “When did the baby fall asleep?” “Who last saw the baby alive?” “Who discovered the baby, and what did that person do?” “What position was the baby in when he/she was found?” “Were there covers over the baby’s head?” “Was CPR attempted?” “Did the baby share a bed with anyone else?” “What was the general health of the baby?” “Had the baby been ill recently?”

The individual investigating the death will take notes about the appearance of the room where the death occurred; condition and characteristics of the crib or sleeping environment; objects, if any, in the crib; medications at the death scene; and any unusual or dangerous items in the room, such as sharp objects or plastic bags. The investigator may make notes about the behavior of those present at the death scene. The investigator will also photograph the death scene and record the temperature of the room. It is likely that investigators will collect the infant’s bedding (e.g., sheets, blankets, etc.), any objects in the crib (e.g., toys or bottles), or any unusual or dangerous items found near the death scene.

**Autopsy**

An autopsy provides evidence of the cause of death through microscopic examination of tissue samples and examination of the body and vital organs. An autopsy is particularly important when a SIDS death is suspected because a definitive diagnosis cannot be made without a thorough postmortem examination. It is estimated that in 15 percent of cases suspected to be SIDS, the autopsy identifies another cause of death, such as a disease or genetic disorder, as well as unintentional injury or unnatural death. Also, if a cause (or causes) of SIDS is ever to be uncovered, it is likely that the cause will be detected from evidence gathered from a thorough pathological examination.
An autopsy may help parents and other caregivers deal with the death. According to noted authority Marie Valdes-Dapena, M.D., parents whose child has died need to know why the death occurred; they need to be reassured that their baby’s death could neither have been predicted nor prevented. Moreover, an autopsy leading to a diagnosis of SIDS will help remove the parents (or caregiver) from potential suspicion of wrongdoing by the legal system and by society in general.

Parents are usually anxious to consult with the pathologist after the autopsy. Discussing the autopsy results often helps most parents accept the reality of their infant’s death. The pathologist reviews the autopsy results, explaining in terms the parents can understand how these findings point to a determination of cause of death. The pathologist should also take the time to answer parents’ questions, responding with “compassion, understanding, and respect for the parents’ dignity and grief”.

**Review of the Infant’s and Family’s Medical Histories**

A comprehensive medical history is essential for a SIDS diagnosis. Along with a death scene investigation and an autopsy, a careful review of the infant’s and family’s history of disease, previous illnesses, accidents, and behaviors often helps to corroborate what is detected from the death scene investigation and the autopsy.[13]

**Risk factors for SIDS**

SIDS victims share three major characteristics

1) The infants appear healthy prior to death. There may be evidence of a slight cold or stuffy nose, but there is usually no history of a significant respiratory infection.

2) The infants die during sleep. The death occurs silently, with no warning.

3) The infants are most often between the ages of 28 days and 1 year of age. Ninety percent of the deaths occur under 6 months of age; the majority between 2 and 4 months.

Other common characteristics of SIDS victims have been identified. These characteristics are called risk factors because they seem to put a baby at higher risk for SIDS. They do not cause SIDS. Risk factors can be categorized as infant, maternal and environmental. Some of these risk factors can be modified, giving a baby the best chance for survival.[14]

- **Infant risk factors include**
  - Male
• Low birth weight
• Prematurity
• Multiple births (twins, triplets, etc.)
• African American (2-3 times greater risk)
• Native American (2-3 times greater risk)

• Maternal risk factors include
  - Smoking during or after pregnancy
  - Under 20 years of age at the first pregnancy
  - Short interval between pregnancies
  - Late or no prenatal care
  - Placental abnormalities
  - Low weight gain during pregnancy
  - Anemia
  - Alcohol and substance abuse
  - History of sexually transmitted disease (STD) or urinary tract infection (UTI)

• Environmental risk factors include:
  - Stomach or side-lying positioning for sleep
  - Exposure to cigarette smoke during pregnancy or after birth
  - Soft bedding including loose sheets, bumper pads, fluffy blankets, pillows, cushions, Sheepskin and waterbeds
  - Stuffed toys, extra clothing, wedges and other objects in the crib
  - Bed sharing
  - Sleep surfaces including recliners, couches, mattresses that are meant for adults, not Infants.
  - Fall and winter months
  - Overheating by warm room temperature or excessive clothing

Mothers who smoke during pregnancy are three times more likely to have a SIDS baby, and exposure to passive smoke by mothers, fathers and others in the household doubles a baby’s risk of SIDS.\textsuperscript{115} \textit{cribfoafe Sleep for}
How to reduce risk factors of SIDS

Make sure that everyone who cares for your baby puts the baby on his or her back to sleep. Use a firm, tight-fitting mattress in a crib that meets current safety standards. Remove pillows, quilts, comforters, sheepskins, stuffed toys, and other soft products from the crib. Dress your baby in sleep clothing so that you will not have to use any other covering over the baby. Place your baby so that his or her feet are at the bottom of the crib. Tuck a thin blanket around the bottom of the crib mattress, reaching only as far as the baby’s chest.[16]

- Make sure the baby’s head remains uncovered during sleep.
- Keep your baby warm, but not too warm.
- Make sure that everyone who cares for your baby understands the dangers of soft bedding.
- Avoid adult beds, waterbeds, sofas, or other soft surfaces for sleep.[17]

CONCLUSION

The death scene investigation is an essential component of a thorough investigation of SIDs. Information gathered during the scene investigation augments that obtained from an autopsy and review of the infant’s clinical history. Information gathered during a SIDS scene investigation can help the pathologist interpret postmortem findings and rule in or rule out accidental, environmental, and unnatural causes of deaths, including child abuse and neglect. Although the ultimate goal of a SIDS scene investigation is to accurately assign a cause of death, no less important goals are identifying health threats posed by consumer products, identifying and understanding risk factors associated with SIDs.

REFERENCE

4. The Foundation for the Study of Infant Deaths (FSID) is the UK’s leading charity working to prevent sudden deaths and promote health, July 2009.

7. Sudden Infant Death Syndrome (SIDS) is the sudden death of an infant under 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 (Willinger et al., 1991)


10. Reduce the Risk of Sudden Infant Death Syndrome (SIDS).


15. That Blacks and males are at higher risk for an unsafe sleep-related death has been discussed earlier in this report. There were no infants identified as Native American who died in a sleep environment in Virginia in., 2009.
