

Sudden infant death syndrome (SIDS)

Synonyms: cot death (especially amongst the general public)

What is sudden infant death syndrome?

Sudden infant death syndrome (SIDS) describes the sudden and unexplained death of a child under the age of 1 year. It is a tragic event which comes as a devastating shock to families involved.

Sudden infant death syndrome is defined as the sudden and unexpected death of an infant under 1 year of age, apparently occurring during sleep, which remains unexplained after a thorough investigation including a complete autopsy and review of the circumstances of death^[1]. All other possible causes of death must be excluded for this diagnosis to be made.

The terms 'sudden and unexpected infant death' (SUID) or 'sudden unexpected death in infancy' (SUDI) are sometimes used to describe all deaths, regardless of cause. Cases of SUID that remain unexplained after post-mortem examination and review of the history and circumstances surrounding the death are classified as sudden infant death syndrome. Around 80% of SUID cases are due to SIDS. The remainder have a clear cause such as severe infection, inherited disorders of fatty acid oxidation or genetic cardiac channelopathies.

Whilst the pathogenesis of SIDS is not yet fully elucidated, there is evidence that an important subset of SIDS infants have serotonergic abnormalities resulting from a problem in the medullary reticular formation which is comprised of nuclei that contain serotonin neurons^[2]. This lesion could lead to a failure of protective brainstem responses to homeostatic challenges during sleep in a critical developmental period which cause sleep-related sudden death. This is known as the serotonin brainstem hypothesis.

Epidemiology^[3]

- In the Western hemisphere sudden infant death syndrome is the most common cause of death of children between the ages of 1 month and 1 year.
- Since 2004, the sudden infant death mortality rate has halved to 0.16 deaths per 1,000 live births in 2019.
- In 2019 SIDS deaths accounted for 59.4% of unexplained infant deaths.
- Mothers aged under 20 are over five times more likely to experience unexplained infant deaths than mothers aged over 40.
- According to the Centers for Disease Control and Prevention (CDC), the incidence of SIDS in 2017 was 35.4 per 100,000 live births in the USA^[4].

Risk factors for sudden infant death syndrome

Although sudden infant death syndrome cannot be prevented, there are several factors which are known to be associated with increased risk. Unexplained infant deaths are more likely to occur in males (in 2019, males had 0.29 unexplained deaths per 1,000 live births compared with 0.24 for females^[3]), during the postneonatal period (after 28 days of age), and in low birthweight babies. Since 2004, the rate of unexplained infant deaths has been around four times higher among low birthweight babies (less than 2,500 g) than babies with a normal birthweight.

A 'Triple Risk Model' was proposed in 1994, emphasising the role and interaction of a number of factors in the pathogenesis of SIDS.

In this model, SIDS occurs when three factors are present simultaneously.

These factors are:

- An underlying vulnerability in the infant – eg, low birth weight or prematurity.
- A critical developmental period – usually 1–3 months of age.

- An 'exogenous stressor' – eg, sleeping prone. It is thought that a combination of immature cardiorespiratory control systems and a failure to be roused from sleep lead to death.

Maternal smoking and SIDS^[5]

Maternal smoking is a risk factor for sudden infant death syndrome. SIDS is more frequently observed in infants of smoking mothers. The global prevalence of smoking during pregnancy is 1.7% and up to 8.1% of women in Europe smoke during pregnancy and worldwide 250 million women smoke during pregnancy. The level of risk due to smoking is dose-dependent and passive exposure to smoke during infancy has also been shown to increase the risk^[6]. If both parents smoke, the risk is further increased.

Other maternal risk factors^[4]

Historically some other maternal features have been shown to be associated with an increased risk of sudden infant death syndrome. These include:

- Alcohol and substance abuse. This becomes a further issue when there is bed-sharing with the infant (discussed below).
- Age less than 20 at first pregnancy. In 2019, the unexplained infant mortality rate was highest for mothers aged under 20 years, at 0.96 deaths per 1,000 live births^[3]. This is over five times higher than for mothers aged 40 years and over.
- Poverty or lower socio-economic status.
- No supportive relationship.

Preterm birth

Prematurity is associated with a four-fold increased risk of sudden infant death syndrome. This may be partly related to the fact that preterm babies are often placed prone whilst in special care baby units in order to improve respiratory function. It is important that they get used to sleeping on their back before discharge.

Other obstetric risk factors

- Late or no antenatal care.
- Low pregnancy weight gain.

- **Placental abnormalities.** Such abnormalities may account for low birth weight, which is a risk factor for SIDS.

Sleep position

Prone sleeping is a major, modifiable risk factor and following campaigns to raise awareness of this, the numbers of cot deaths fell significantly^[7]. Placing babies on their backs to sleep is advice which should be reinforced by professionals. Parents should be reassured that the risk of aspiration is not increased by sleeping in this position and a number of studies have confirmed this.

Bed-sharing and SIDS

The issue of advising parents about sharing a bed with their baby is a potentially sensitive one and has received much prominence in the literature of late. Although it is a very common practice worldwide, there is emerging evidence that co-sleeping does increase the risk of SIDS^[8]. Advice varies internationally. In the UK in 2014, the National Institute for Health and Care Excellence (NICE) updated its guidance to advise parents that sharing a bed with their baby is associated with an increased risk of SIDS. This risk is further increased for low-birth-weight babies, when the adult sleeping with the baby has had alcohol or drugs and if either parent smokes.

Falling asleep with a baby in a sofa or armchair carries an even higher risk.

Department of Health and the Lullaby Trust (formerly the Foundation for the Study of Infant Deaths) advice is that the safest place for babies to sleep in the first six months of life is in a separate Moses basket or cot, in the parental bedroom^[9]. Room-sharing is protective but bed-sharing increases the risk.

Bedding

Evidence shows that bedding has covered the infant's head in a significant number of deaths from SIDS. Soft bedding increases the risk of sudden infant death syndrome by five times and by much more if the baby is prone.

Therefore, advice to parents is^[10]:

- Duvets, quilts and pillows should not be used.

- The baby's head should not be covered.
- An infant sleeping bag is theoretically safer than blankets. However, where blankets are used, they should be thin and the infant should be placed with their feet at the foot of the cot. The blankets should be tucked in on three sides in such a way that they do not reach above the infant's armpits.
- Mattresses should be firm.
- Room temperature should be around 16–20°C and babies checked to make sure they feel a suitable temperature.

Protective factors

The following are associated with a reduced risk of sudden infant death syndrome^[10] :

- Breastfeeding. Reduces risk and risk is further reduced if exclusively breastfeeding^[11] .
- Dummies. There is consistent evidence that babies who die from SIDS are less likely to have used a dummy in their final sleep. However, advice varies, as dummies are thought to possibly reduce the length of breastfeeding time and therefore have other disadvantages. A Cochrane review failed to demonstrate that dummies have either a positive or a detrimental effect on risk of SIDS^[12] .
- Room-sharing. A baby sleeping in the parental bedroom has a reduced risk of SIDS by possibly as much as 50%. Advice from the Lullaby Trust is therefore that babies should sleep in the parental bedroom (but not in the parental bed) for the first six months of life.

Attending a sudden infant death

The sudden death of a child is likely to be very traumatic for all concerned and that includes the attending doctor. Parents are likely to be in a state of shock and any professional attending in such a situation will need to be very sensitive and considerate in their handling of the family.

GPs are rarely likely to be involved in attending a sudden infant death but in the event of doing so, the following may be helpful:

- When first looking at the infant, note the position in which the child is lying, the clothes the child is wearing, and any secretions, etc on the child's face, and make an accurate recording of these observations as soon as possible, so as to have contemporaneous notes.
- Once it has been established that death has indeed taken place, the initial concern must be for the parent/s and other members of the family in attendance. After allowing a little time for them to accept the fact of the death, it must be gently explained to them that all cases of sudden death from any cause must be reported to the coroner or, in Scotland, the procurator fiscal, that police officers will call and that this is a routine process and not because of any suspicious circumstances.
- Ask if there is anyone that you can call to come to stay with them, or look after siblings, particularly in the case of single parents.
- The family of the child is likely to need support through the period of investigation and mourning and the death should be reported to their usual doctor and health visitor at the earliest opportunity.

Suggestions for GPs include:

- Don't avoid contact. Even a short phone call is appreciated.
- Express your sympathy and sorrow and your availability for ongoing support. Ask if you can do anything immediately.
- Use the baby's name.
- Ensure the parent/s have the contact details of the Lullaby Trust for support and advice.
- Avoid asking the parent/s to tell you about the event, unless they are keen to do so.
- Avoid clichés and comparisons to other cases.

Differential diagnosis

In approximately 37% of cases of sudden unexpected deaths in infancy, a post-mortem will identify a cause of death ^[13] :

- Disease

- Genetic disorder
- Accidental injury
- [Safe-guarding](#) issues

Life-threatening events

Apparent life-threatening event syndrome used to be called near miss cot death. The term was dropped as there is NO evidence of association with or an increased risk of SIDS and the condition has different epidemiology. It is a presenting symptom, not a diagnosis.

- It affects predominantly children younger than 1 year.
- There are frightening symptoms with some combination of apnoea, change in colour, change in muscle tone, coughing or gagging.
- Approximately 50% of these children are diagnosed with an underlying condition that explains the event.
- The most common causes are gastro-oesophageal reflux, lower respiratory tract infections and seizures.
- The cause remains unknown in around half.

The value of apnoea monitors is controversial, as they have not been proven to prevent sudden infant death syndrome. However, parents often feel reassured that they are 'doing everything they can', whilst using one.

There are a few cases, documented by covert video surveillance, in which parents have induced illness in their children. This can result in serious neurological damage and even death. The implications are discussed in the separate [Fabricated or Induced Illness by Carers \(FII\)](#) article.

Recurrent infant deaths

There are occasions when more than one infant death occurs within a family and explanations are sought. Siblings of SIDS infants have an increased risk of dying as a result of SIDS. Siblings are 5-6 times more likely than the general population to die from SIDS^[4]. After investigation, not all sibling deaths can be attributed to SIDS. Sibling deaths have also been found to be attributable to inborn errors of metabolism, abuse, and malnourishment.

The Care of the Next Infant (CONI) programme is available throughout most of the UK. All second infant deaths until 1990 were studied for one paper which reported^[14] :

- 57 infant deaths, giving a rate of 8.9 per 1,000 that is rather higher than would have been expected with no past history.
- Of the deaths, 9 were inevitable, and 48 were unexpected.
- Of the 48 unexpected deaths there were 2 in each of 2 families and a single one in the other 44.
- Of the 46 first CONI deaths, 40 were natural but the other 6 were probable homicides.
- There were 5 committed by one or both parents and 2 resulted in criminal conviction.

The conclusion is that repeat deaths occur and are usually natural but murder by parents does occur. However, some doubts were subsequently cast upon the method of classification of deaths as natural or unnatural in this report.

Sudden infant death syndrome prevention

SIDS cannot be prevented completely but experience shows that it can be reduced. This requires attention to the various risk factors outlined above. In particular, advice about placing the baby to sleep in the supine position in the infant's parental bedroom and avoidance of parental smoking are important.

Supine sleeping position has, however, increased the incidence of flattening of the occiput (deformational plagiocephaly)^[15] . To try to prevent this, infants should have supervised 'tummy time' when awake – spending as much time as possible in the prone position. The use of helmet therapy remains controversial.

Further reading

- [The Lullaby Trust](#)
- [Care of Next Infant \(CONI\)](#); The Lullaby Trust

- [Ivanov D, Mironova E, Polyakova V, et al](#); Sudden infant death syndrome: Melatonin, serotonin, and CD34 factor as possible diagnostic markers and prophylactic targets. *PLoS One*. 2021 Sep 10;16(9):e0256197. doi: 10.1371/journal.pone.0256197. eCollection 2021.
- [Postnatal care – Benefits and harms of bed sharing](#); NICE guideline NG194 Evidence review underpinning recommendations 1.3.13 to 1.3.14, April 2021

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9. [Sudden Infant Death Syndrome – A guide for professionals](#); The Lullaby Trust
10. [Postpartum care](#); NICE Guidance (April 2021)
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14. [Carpenter RG, Waite A, Coombs RC, et al](#); Repeat sudden unexpected and unexplained infant deaths: natural or unnatural? *Lancet*. 2005 Jan 1-7;365(9453):29-35.
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