

Sudden infant death syndrome

Recent focus on the respiratory system

The sudden infant death syndrome is now the commonest cause of death between 28 days and 12 months, accounting for two fifths of all postneonatal deaths (p 716). The cause or, more likely, causes still elude us.

Striking ethnic variations warrant further investigation. Although overall postneonatal mortality is little affected by the ethnic origin of infants defined by their mothers' country of birth (apart from those from Pakistan), the incidence of the sudden infant death syndrome varies considerably, with particularly low incidence in babies whose mothers come from Bangladesh, India, and Africa. These findings are surprising in view of the prevalence of generally recognised risk factors in these communities—a high proportion of people of lower social class, high parity, short birth intervals, and low birth weight and gestational age.¹ These factors are somewhat offset by the low prevalence of smoking, fewer births to young mothers, and lower rates of illegitimacy.

A second paper (p 721) reports the low incidence of the syndrome in Hong Kong, only 0.29 per 1000 live births. A different "stereotype" was found with a slight excess of baby girls; an early peak incidence; and no relation to parental age, unemployment, or low social class. One explanation offered was that positioning the babies supine, a normal practice in Hong Kong, might protect against the sudden infant death syndrome. In this study 44% of the index cases were nursed prone, compared with only 7% of the controls.

Another epidemiological study (p 722) has suggested that the general adoption of prone positioning advocated at a lecture at a paediatric conference in 1971 may partly explain the threefold increase in the incidence of the sudden infant death syndrome in The Netherlands since then. Many previous control studies have examined the possible influence of nursing positions. Interestingly, as noted by Beal,² nine studies have shown that nursing prone is a significant risk factor and none has reported that appreciably more infants dying of the sudden infant death syndrome were nursed supine than age matched controls. A recent paper has suggested that the face is an important source of cooling³ so that prone positioning may reduce heat loss and make a baby who is overwrapped more susceptible to hyperthermia.⁴

Lee *et al* (p 721) propose an alternative hypothesis—that Hong Kong's overcrowded households confer an advantage, providing a continuous stimulus to the baby. Compatible with this is the low incidence of the sudden infant death syndrome

in the Afro-Asian babies in England and Wales, many of whom are also likely to be living in crowded conditions.

The possible role of the upper airway in the sudden infant death syndrome has also provoked considerable interest. Striking anecdotal evidence now exists that at least some of these tragic deaths are due to upper airway obstruction. Southall and his colleagues have recently described six infants with recurrent apparently life threatening episodes due to obstructive apnoea.⁵ Fibreoptic endoscopy showed closure of the oropharynx and hypopharynx on inspiration in four of them. None had appreciably enlarged tonsils and adenoids, and all benefited from continuous positive airway pressure with or without tracheostomy.

Two recent publications reported cardiorespiratory monitoring of babies who subsequently died from the sudden infant death syndrome. Both studies, on babies considered to be at high risk, showed that those dying tended to have longer attacks of central apnoea, although these remained within the normal range.^{6,7} One of the studies also found an appreciable increase in obstructive and mixed apnoea,⁷ further supporting the incrimination of upper airway obstruction in the aetiology of the syndrome. Nursing otherwise healthy babies supine may protect the upper airway, but this is unlikely given the consistent finding that babies with anatomical abnormalities such as the Pierre Robin syndrome can survive only in the prone position.

Investigators in Oslo have compared hypoxanthine concentrations in the vitreous humour of babies dying from the sudden infant death syndrome with those in age matched babies dying from non-respiratory causes.⁸ (The vitreous humour has the advantage of retaining its antenatal biochemical characteristics for a considerable time after death.) They found that the hypoxanthine concentrations were greatly raised in babies dying of the syndrome. Hypoxanthine is a breakdown product of adenosine monophosphate, a catabolic process that is accelerated by hypoxia, so this provides further evidence that the babies were suffering from recurrent episodes of hypoxia before the terminal event. Deciding whether this was due to any particular pattern of apnoea, however, is obviously impossible.

Many babies dying of the sudden infant death syndrome have evidence of a viral upper respiratory tract infection. These infections might adversely affect babies at risk by several different mechanisms. Viraemia raises the metabolic

rate and so might lead to hyperpyrexia in a vulnerable and overswaddled infant. The local inflammatory changes in the upper airway may increase susceptibility for closure to occur on inspiration, and viral infections are often associated with central apnoea in otherwise healthy babies.⁹

A recent study has suggested that babies dying from the sudden infant death syndrome may have a defect of their immune system.¹⁰ Greatly increased concentrations of IgG, IgM, and, to a lesser extent, IgA were found in the lungs of babies dying from the syndrome compared with a matched group of babies dying from known non-respiratory causes. The authors concluded that this was an abnormal immunological response to a minor infection rather than an overwhelming infection by an unidentified respiratory pathogen.

These papers support the claim that research into the respiratory system is more likely to lead to the understanding of the sudden infant death syndrome than other approaches. Should we now recommend that babies be nursed supine or in the lateral position rather than prone? In our opinion we have not yet reached that point but should be looking much more closely at the upper airway and, in particular, the

effects of nursing position on the airway and mechanics of respiration.

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- 1 Golding J, Limerick S, MacFarlane A. *Sudden infant death: patterns, puzzles and problems*. Shepton Mallet: Open Book Publishing, 1985.
- 2 Beal S. Prone or supine for pre-term babies? *Lancet* 1988;ii:512.
- 3 Nelson EAS, Taylor BJ, Weatherall IL. Sleeping position and infant bedding may predispose to hyperthermia and the Sudden Infant Death Syndrome. *Lancet* 1989;ii:199-200.
- 4 Stanton AN, Scott DJ, Downham MAPS. Is overheating a factor in some unexpected infant deaths? *Lancet* 1989;ii:1054-7.
- 5 Southall DP, Croft C, Stebbins V, et al. Detection of sleep associated dysfunctional pharyngeal obstruction in infants. *Eur J Pediatr* 1989;148:353-9.
- 6 Kelly DH, Golub H, Carley D, Shannon D. Pneumograms in infants who subsequently died of Sudden Infant Death Syndrome. *J Pediatr* 1986;109:249-54.
- 7 Kahn A, Blum D, Rebuffat E, et al. Polysomnographic studies of infants who subsequently died of Sudden Infant Death Syndrome. *Pediatrics* 1988;82:721-7.
- 8 Rognum TO, Saugstad OD, Oyasaeter S, Olaisen B. Elevated levels of hypoxanthine in vitreous humor indicated prolonged cerebral hypoxia in victims of Sudden Infant Death Syndrome. *Pediatrics* 1988;82:615-7.
- 9 Steinschneider A. Nasopharyngitis and prolonged sleep apnea. *Pediatrics* 1975;56:967-71.
- 10 Forsyth KD, Weeks SC, Koh L, Skinner J, Bradley J. Lung immunoglobulins in the sudden infant death syndrome. *Br Med J* 1989;298:23-6.

General practitioner obstetrics

Time to think again about GP deliveries

General practitioner obstetrics remains one of the riddles of medicine. The progressive decline since 1970 in the number of deliveries for which general practitioners and community midwives were responsible has happened without any direct evidence of the advantages of hospital confinement. Indeed, all the comparisons have shown that perinatal mortality rates for planned deliveries under the care of general practitioners are as good as under consultant care.¹⁻¹³ The problem with this bald conclusion arises from interpretation: how much of the risk of hospital confinement is attributable to selection of the hospital population?

Tew tried to answer this question by analysing data from the British births survey of 1970. Standardising the data using information on biological and social factors combined to give antenatal and labour prediction scores, she concluded that the perinatal mortality rate was lower for women delivering under the care of general practitioners at all levels of risk except the highest.^{14,15} Her conclusions have been criticised on the grounds that her method was not widely validated and may not have taken account of subtle selection biases. A paper from New Zealand, however, which reported national data according to the type of hospital, provides some support. In the smallest hospitals with fewest technical facilities the birthweight specific perinatal mortality rate was lowest in all groups except in the children with birth weights of less than 1500 g.¹⁶

The figures have always been hard to explain. Tew believes that obstetric intervention may actually do harm, especially to low risk patients. Experience in managing low risk pregnancy may be a valuable asset, but hard to measure. Drife has recently pointed out that few women could now expect to be attended in labour by an experienced midwife who was in direct contact with an experienced doctor. This had been the case when general practitioners were responsible for managing most pregnancies but rarely pertains now in hospitals, where so many deliveries are done by student midwives supervised by senior house officers.¹⁷

Campbell and MacFarlane in a comprehensive review of general practitioner obstetrics concluded that the case could not be proved either way and that "there is no evidence to support the claim that the safest policy is for all women to give birth in hospital."¹⁸ They also regretted that no randomised study had been done when there were sufficient general practice deliveries to support such a study. With the overall reduction in perinatal mortality rate it would now take a study of 704 000 low risk women for a trial having 80% power to detect a 5% difference in perinatal mortality.¹⁹

If the perinatal mortality rate is no longer a useful guide to policy then morbidity and consumer satisfaction become more important. Mothers generally prefer deliveries by general practitioners than by consultants.²⁰ The Oxford study compared women delivered under general practitioner and consultant care and found lower rates of obstetric intervention and use of analgesia in the former.^{3,4} A study in The Netherlands showed that women who opted for home confinement had fewer complications of pregnancy, delivery, or puerperium and that their babies had lower rates of transfer to a special infant care unit when compared with those of women opting for hospital confinement.²¹

More recently general practitioner obstetrics has declined with the closure of small peripheral maternity units by health authorities adept at spotting easy targets. Again, evidence to support the belief that general practitioner units are more expensive than consultant units does not exist. Straight-forward comparisons are difficult because of the problems of standardising inputs. One study tried to take into account the costs of obstetric care, looking at the costs of antenatal and postnatal visits, labour, transfers from general practitioner units to consultant units, and also the costs to the family. The differences were less than expected because of the cost of midwife visits to the home in general practitioner care, and the overall cost was sensitive to variations in the rate of transfer. Nevertheless, the study concluded that deliveries at home and in general practitioner units were slightly cheaper