

Ethnic differences in incidence of sudden infant death syndrome in Birmingham

D Kyle, R Sunderland, M Stonehouse, C Cummins, O Ross

Abstract

Among the 45 204 live births in Birmingham in the three calendar years 1981-3, there were 218 postneonatal deaths, giving a postneonatal mortality rate of 4.82 per 1000 live births. Postneonatal mortality rates were 4.22 for whites, 5.91 for Asians (relative risk 1.26, 95% confidence interval (CI) 1.04 to 1.53) and 8.20 for Afro-Caribbeans (relative risk 1.78, 95% CI 1.25 to 2.55). Among Asians malformations were common (3.36) and sudden infant death syndrome rare (1.18), in contrast to Afro-Caribbeans among whom the rates were 0.66 and 5.25, respectively.

Logistic regression analysis demonstrated a significantly lower risk of sudden infant death syndrome (SIDS) in Asians and significantly raised risks of SIDS in very low birthweight babies and those with unemployed parent(s).

Ethnic differences persisted after controlling for maternal age, social class, and birth weight. Studies of sociocultural differences in child rearing practices are needed and may uncover important aetiological factors of sudden infant death syndrome.

Despite the fact that north/south differences in postneonatal mortality rates have evened out, there remain important differences among regions, especially between deprived inner city communities and the more privileged who live in the suburbs and shires.¹ The principal cause of postneonatal mortality is now the sudden infant death syndrome (SIDS). In attempting to identify priorities for its prevention, studies have recommended attention to health care services, the importance of educating parents in child care,² the infant's sleeping position,³ and have examined social aspects such as maternal age and legitimacy.⁴ The possibility that ethnic factors may have a role is raised by some studies.⁵⁻¹⁰

This paper examines the postneonatal course of all children born in Birmingham between 1981 and 1983 from the results of interviews between parents and health visitors.

Subjects and methods

Details of the birth and survival during the first year of all children born to mothers resident in Birmingham are recorded in the Birmingham birth register, a continuing record based on returns made by midwives, health visitors, child screening, and mortality records. Ethnic group is assigned by the health visitor after personal contact with the parents and thus differs from

the Office of Population Censuses and Surveys (OPCS) classification, which is by mother's country of birth.^{11 12} A considerable advantage of this classification over that of the OPCS is that second generation ethnic births are identified by our method. This is particularly important in Birmingham, as 40% of the Afro-Caribbean births in the city in 1981-3 were to women who had been born in the United Kingdom. These mothers are 'English' yet their babies are black; similarly Asian immigrants from east Africa are 'African' but their babies are brown. Differing genetic and sociocultural influences are better reflected by our method than by arbitrary assignation by the mother's place of birth.

Infants were classified into one of four groups, white, Asian (Indian, Pakistani, or Bangladeshi), Afro-Caribbean, and other (including oriental and those of mixed ethnic origin).

The Birmingham Births Register has available details of all births and deaths of children known to be resident in Birmingham, irrespective of place of birth or death. Most of the migration of children in the first year of life occurs between different parts of the City of Birmingham and would thus pose no problem. If a child resident in Birmingham subsequently moved out of the City in their first year of life, however, and then succumbed elsewhere, it is possible that the details of their death would not be known to the register. This should only affect the results if there was significant differential migration out of the city of those babies more or less at risk of SIDS, or of different ethnic groups, which we do not think is likely.

Social class was coded to include both single and two parent unemployed families as 'other' social class, on the grounds that unemployment may be categorised as a 'poorer' social condition than unskilled manual employment.

Full details of children who died between 1 month and 1 year of age were obtained for all children born in 1981-3 inclusive, and the cause of death was assigned from these records. These were the most recent years for which complete records were available for the whole of Birmingham. Only cases recorded as 'sudden infant death syndrome' on the death certificate were included as such. All sudden infant deaths in Birmingham are referred to HM Coroner, and all have necropsies by one of a small group of pathologists, all of whom are trained in techniques of paediatric necropsy. Assigning cause of death directly from mortality data rather than from coded national statistics is another impor-

Department of
Public Health Medicine,
Vincent Drive,
Edgbaston,
Birmingham B15 2TZ
D Kyle
M Stonehouse

Selly Oak Hospital,
Birmingham
R Sunderland
O Ross

Department of
Social Medicine,
University of
Birmingham
C Cummins

Correspondence to:
Dr Kyle.

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tant difference between this and the OPCS national study.¹¹ As SIDS is essentially a diagnosis of exclusion, accuracy of certification and coding are vital. In large scale studies of childhood mortality there is evidence of invalid death certification, as well as errors in the coding of death certificates by lay clerks, and confounding changes in the classification of the causes of death.^{13 14}

Statistical analysis was carried out by estimating the relative risks of postneonatal mortality and SIDS in the different ethnic groups, calculating 95% confidence intervals (CI)¹⁵ and the Mantel-Haenszel test.¹⁶ The Mantel-Haenszel estimates of relative risk after controlling for ethnic group were calculated, and Mantel's extension of the Mantel-Haenszel test was used to test for trends after controlling for ethnic group. A logistic regression analysis of SIDS deaths among babies surviving beyond 28 days was also carried out.

Results

Numbers of live births and details of postneonatal deaths for each ethnic group are shown in table 1. There were no deaths in this period that could not be linked to birth data. Asian names, particularly as recorded on birth notification forms, are difficult to link to other data. In this study, however, it was possible to match the birth register record with the health visitor record, which contained the information from which the birth register records were coded. In difficult cases matching was done not only on

name, but also on other variables such as mother's date of birth, parity, hospital of birth, birth weight, and original address. The overall relative risks for postneonatal death were: Afro-Caribbean compared with white 1.78 (95% CI 1.25 to 2.55), and Asian compared with white 1.26 (95% CI 1.04 to 1.53).

The relative risks for postneonatal death excluding SIDS were: Afro-Caribbean compared with white 1.41 (95% CI 0.77 to 2.59), and Asian compared with white 1.71 (95% CI 1.40 to 2.08). The relative risk of dying from a congenital malformation for Asians compared with whites was 2.07 (95% CI 1.67 to 2.56).

Breakdown of the SIDS by ethnic group and social class, maternal age, birth weight, and number of persons/room in the household are given in table 2.

The relative risk of SIDS in Afro-Caribbean compared with white infants was 2.09 (95% CI 1.35 to 3.24). The relative risk in Asian compared with white infants was 0.61 (95% CI 0.37 to 1.01).

After controlling for ethnic group, and subdividing birth weight into less than 2500 g ('low birth weight') and 2500 g and over ('normal birth weight') the increased Mantel-Haenszel relative risk for SIDS was not significant ($r=1.78$, 95% CI 0.92 to 3.41).

Testing for trends in SIDS with maternal age and social class after controlling for ethnic group, we found a significant trend with decreasing maternal age (log rank $\chi^2=22.47$, df 1, $p<0.001$) and lower social class (log rank $\chi^2=23.24$, df 1, $p<0.001$). There was no

Table 1 Number (rate/1000 live births) of postneonatal deaths among Birmingham births 1981-3 by ethnic group and cause

	Ethnic group			
	White	Asian	Afro-Caribbean	Other
No of live births	27944	10999	3049	3212
No of postneonatal deaths:	118 (4.22)	65 (5.91)	25 (8.20)	10 (3.11)
Infection	16 (0.57)	8 (0.73)	5 (1.64)	3 (0.93)
Congenital malformations	25 (0.89)	35 (3.18)	2 (0.66)	2 (0.62)
Sudden infant death syndrome	63 (2.25)	13 (1.18)	16 (5.25)	4 (1.25)
Accident	3 (0.11)	1 (0.09)	1 (0.33)	0
Malignant disease	3 (0.11)	1 (0.09)	0	0
Prematurity	2 (0.07)	0	0	0
Other	6 (0.21)	7 (0.64)	1 (0.33)	1 (0.31)

Table 2 Number (rate/1000 live births) of postneonatal deaths from sudden infant death syndrome among Birmingham births 1981-3 by ethnic group, social class, maternal age, and birth weight

	Ethnic group			
	White	Asian	Afro-Caribbean	Other
Social class:				
I/II	4 (0.87)	0	2 (9.35)	0
III	27 (1.76)	5 (1.44)	1 (0.80)	0
IV/V	13 (3.32)	5 (1.14)	3 (7.54)	0
Other	19 (4.61)	3 (1.44)	10 (8.45)	4 (2.80)
Maternal age (years):				
<20	16 (5.16)	1 (1.10)	6 (7.41)	2 (2.97)
20-35	44 (1.93)	11 (1.22)	10 (4.74)	2 (0.84)
≥35	3 (1.47)	1 (0.90)	0	0
Birth weight (g):				
<2500	5 (2.47)	2 (1.67)	6 (16.44)	0
≥2500	58 (2.24)	11 (1.12)	10 (3.73)	3* (1.04)
Persons/room†:				
<1.5	51 (2.12)	6 (0.98)	11 (4.85)	3 (1.62)
≥1.5	10 (3.17)	6 (1.41)	5 (7.09)	0

*One for whom birth weight unknown was excluded.

†Excluded if number not known.

Table 3 Logistic regression analysis of SIDS deaths in babies surviving at least 28 days

Independent variable	Coefficient	Odds ratio	95% Confidence interval
Asian*	0.620	0.538	0.295 to 0.981
Afro-Caribbean	0.537	1.712	0.964 to 3.040
Other non-white	-1.157	0.314	0.098 to 1.013
≥1.5 persons/room	0.071	1.074	0.642 to 1.797
Birth weight ≥1500<2500 g	0.439	1.550	0.822 to 2.926
Birth weight* <1500 g	1.836	6.273	2.269 to 17.341
Maternal age <20	0.269	1.308	0.773 to 2.213
Maternal age ≥35	-0.460	0.631	0.087 to 4.597
Social class I or II	-0.156	0.856	0.395 to 1.853
Social class IV or V	0.403	1.496	0.838 to 2.670
No employed parent(s)*	0.852	2.344	1.414 to 3.887
Sex	0.049	1.050	0.702 to 1.572

*Coefficient/SE ≥2.

significant association between overcrowding (persons/room in the household ≥1.5) and SIDS. This was also true after controlling for ethnic group ($r=1.43$, 95% CI 0.81 to 2.51).

The logistic regression analysis was carried out using babies surviving at 28 days as the population and a SIDS death before the first birthday as the outcome. The dependent variables in the model were Asian ethnic origin, Afro-Caribbean ethnic origin, ethnic origin other than both parents of white, Asian or Afro-Caribbean origin, household with at least 1.5 persons per room, birth weight ≥ to 1500 g and <2500 g, birth weight <1500 g, mother aged <20, mother aged ≥35, social class I or II, social class IV or V, and no social class coded (that is, no working parent in household). The model produced had no significant departures from a good fit to the data and the regression coefficients, odds ratios, and approximate confidence limits produced are given in table 3.

Only the variables Asian ethnicity, birth weight less than 1500 g, and no employed parent reach conventional levels of significance. Asian ethnicity is associated with a significantly low risk of SIDS, while very low birth weight and unemployment are associated with a significantly increased risk of SIDS. Afro-Caribbean ethnicity had a relatively increased risk of SIDS of 1.712, but this just fails to reach conventional levels of significance.

Discussion

In contrast to previous studies of postneonatal mortality in Birmingham,^{17 18} the results of this study show that there has been a significant increase in postneonatal mortality among infants of Afro-Caribbean and Asian ethnic groups compared with whites. Among Afro-Caribbeans this is largely the result of an increased risk of SIDS, and among Asians the risk of SIDS is lower than among whites, but there is an excessive number of deaths from congenital malformations. The previously reported slight increase in 'cot deaths' among Asians has not been confirmed.¹⁸

The expected trend of increased SIDS with decreasing maternal age and lower social class is independent of ethnic group. In the logistic regression analysis, the raised relative risks for maternal age <20 and social class IV and V, and the decreased relative risk for maternal age ≥35 and social class I and II were not significant. Children in families with unemployed parent(s)

were at significantly increased risk of SIDS. This suggests that maternal age is a marker for other socioeconomic factors.

These results confirm the findings of Griffiths *et al* of increased postneonatal mortality in Afro-Caribbean infants in central Birmingham health district,⁹ and show it is largely attributable to SIDS. Analysis of postneonatal deaths by cause (table 1) after studying the detailed mortality records gives no evidence of a diagnostic substitution—say of respiratory infection for SIDS in white or Asian infants. This finding confirms work from the United States,^{5 6} but is in contrast to the findings of Balarajan *et al* for the whole of England and Wales.¹¹ They found the incidence of SIDS among infants of mothers born in the Caribbean was similar to that among infants whose mothers were born in the United Kingdom. The different method of assigning ethnic group could explain this. The difference could also be explained if the immigrant mothers had different child rearing practices or social environments from subsequent generations.

Like Balarajan *et al*, we found that the combination of Afro-Caribbean and Asian infants into an 'Afro-Asian' group was unhelpful. Asian babies have about half the rate of SIDS that whites do. There is no evidence to support the statement of Milner and Ruggins that there is a 'low incidence of sudden infant death syndrome in the "Afro-Asian" babies in England and Wales'.¹² Both Balarajan *et al* and Fedrick (from Oxford)¹⁹ report similar or even higher rates of SIDS in babies of 'Caribbean' and 'West Indian' born mothers, respectively.

In the United States high rates of SIDS among Afro-Caribbean populations are attributed in part to less favourable birth weights and socioeconomic circumstances.²⁰ In this study in the United Kingdom, ethnic differences in rates of SIDS are not totally attributable to socioeconomic factors as measured by social class. We have found in a multivariate analysis that Asians still have a reduced risk of SIDS. Very low birthweight babies have a significantly increased risk. Socioeconomic influences were most strongly expressed in children with unemployed parent(s).

The high mortality rate for malformations among Asians and the low rate among Afro-Caribbeans are consistent with previous studies of perinatal mortality.²¹

Poor social circumstances have been found to be an important contributory cause in most

studies of SIDS. Analysis of those in Birmingham in both 1958–61¹⁸ and 1981–3 shows that most deaths occurred in families resident in geographical areas identified as the most deprived. Yet deaths occurred in other parts of the city, and most of the children living in deprived geographical areas do not succumb, which argues against serious local environmental hazards. Lee *et al* suggested that overcrowded households confer an advantage, providing a continuous stimulus to the baby.⁸ We found no significant relationship between overcrowding and SIDS, either overall or within any ethnic group using either Mantel-Haenszel techniques or logistic regression analysis. Although 38% of Asian babies in Birmingham in 1981–3 were born to mothers living in households with more than 1.5 persons/room, compared with 12% of white babies, 23% of the Afro-Caribbean babies were also born to mothers living in such crowded households. The change from a low rate of SIDS among Afro-Caribbean babies in 1958–61 to a high rate in 1981–3 suggests changes in social rather than genetic factors. Although in the logistic regression analysis this just failed to reach conventional levels of significance there may well be social factors other than overcrowding affecting child care practice in the Afro-Caribbean group which lead to an increased risk of SIDS. The lack of any social class gradient in Asian SIDS babies (table 2) suggests (as did Lee *et al*⁸) that cultural factors may be protective. One of the striking features of the Asian community in Birmingham is the strength and endurance of the extended family.

Further study of the differences in mortality in clearly identifiable subgroups of the population may assist in unravelling some of the continuing questions in the aetiology of SIDS.

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