Ethnic group differences in low birthweight of live singletons in Singapore, 1981-3

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SUMMARY All singleton live births occurring in Singapore in the three years 1981-3 were computed, and birthweight was examined in the different ethnic groups (Chinese, Malay, and Indian). Overall the proportions of babies of very low birthweight (less than 1500 g) and low birthweight (less than 2500 g) were: Chinese 0.3% and 6.1%, Malays 0.4% and 8.5%, and Indians 0.5% and 10.0%. The important finding was that in all gestational periods and virtually all maternal age and live birth order groups Indians had the highest proportion of very low and low birthweight babies. However for prematurity Indians at 6.7% had a higher rate than Chinese (5.1%) but lower than Malays (9.9%). Likewise for neonatal mortality Indians at 8.7 per 1000 live births were between Chinese (7.1) and Malays (9.1). The evidence seems to indicate that the reason for Indians having a higher proportion of low birthweight babies is partly ethnic/genetic, and the cut-off point of 2500 g should perhaps be lowered for babies from the Indian subcontinent when international comparisons are being made.

There are worldwide variations in the proportions of live births that are of low birthweight.¹ In particular, there are known to be very high proportions in India,² and it has been suggested that this may to some extent be for ethnic/genetic reasons.³ There is also some indication that low weight babies are less common in some Chinese populations.⁴

In a previous article we described low birthweight in Singapore in a sample of singleton births between 1967 and 1974.⁵ An important finding to come out of this study was that Indians had smaller babies with a higher proportion of low birthweight babies than Chinese and Malays. The conclusion was that this difference was to some extent probably of ethnic/genetic origin.

In the last few years birthweight in grams and basic demographic and biological information have been recorded centrally on all births in Singapore. This geographically defined population study therefore looks at all singleton live births for the years 1981-3, examining low birthweight by ethnic group. Hence it will be possible to see if ethnic group differences found in our previous study hold for recent years and after removing sampling variation.

Materials and methods

Data for all births occurring in the years 1981-3 were obtained from the Singapore Registry of Births and

Deaths and processed at the National University of Singapore Computer Centre using the SPSS statistical package. Births must by law be registered, and the registration of births is considered to be virtually complete as the birth certificate is an important document for a number of administrative purposes.

For the analysis the ethnic group of the father is used, but the majority of marriages in Singapore are still within the same ethnic group. For example, in 1982 for live births where the mother was Chinese, in 97.7% of cases the father was also Chinese while for Malays the proportion was 88.3% and for Indians 83.6%.⁶

Gestation obviously has a strong bearing on birthweight. Hence the data include analysis by period of gestation which refers to the number of completed weeks the baby was in the mother's womb before birth and is calculated from the first day of the last normal menstrual period. Mother's age and previous pregnancies also influence birthweight, as shown in the 1973 international study by the World Health Organization,⁷ and births are also analysed by these variables. Live birth order is recorded in Singapore rather than parity.

Birthweight distributions are according to the Ninth Revision of the International Classification of Diseases (ICD 9),⁸ which was implemented in Singapore in 1979. This defines low birthweight as less than 2500 g, and birthweight groupings in the form

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less than 1000 g, 1000 g or over but less than 1500 g, and so on. Very low birthweight is less than 1500 g. A live birth is according to the WHO definition.⁸

For the analysis, the live births of 1981, 1982, and 1983 were computed together in order to increase the number of Indian births which are only about 7% of the total. The total number of live singleton births for the three years combined was 139 438 with 131 764 in the three main ethnic groups, of which 125 189 (95.0%) had complete social and biological information recorded and were used in the analysis. Of these, 93 186 (74.4%) were Chinese, 22 390 (17.9%) Malay, and 9613 (7.7%) Indian. As was to be expected, the male: female ratio was very similar in the ethnic groups, being 1.09 in Chinese and 1.07 in both Malays and Indians.

Results

Table 1 shows the distribution of births by low birthweight both overall and by ethnic group. It can be seen that overall the proportions of very low birthweight (less than 1500 g) and low birthweight (less than 2500 g) are 0.3% and 6.8%. By ethnic group the lowest proportions are in the Chinese (0.3% and 6.1%) then the Malays (0.4% and 8.5%), Indians having the highest proportions (0.5% and 10.0%).

Table 1 *Low birthweight of live singletons in the ethnic groups of Singapore, 1981-3*

Ethnic group	Total births	Birthweight (g)%					
		Under 1000	1000-1499	1500-1999	2000-2499	Under 1500	Under 2500
Chinese	93 186	0.1	0.2	0.7	5.1	0.3	6.1
Malay	22 390	0.1	0.3	1.1	6.9	0.4	8.5
Indian	9613	0.1	0.4	1.2	8.3	0.5	10.0
Total	125 189	0.1	0.2	0.8	5.6	0.3	6.8

From Table 2 it can be seen that the proportion of term babies (37-41 weeks) is highest in Chinese followed closely by Indians and then Malays, with rates of prematurity (36 and under weeks) highest in Malays (9.9%), then Indians (6.7%) and then Chinese (5.1%). All ethnic groups show the expected declining proportion of very low and low birthweight births as gestational age goes from pre-term to term. For pre-term babies Malays have the lowest proportion of very low birthweight (3.8%) and Indians the highest (6.0%). Similarly, for low birthweight, Malays are 30.0% with Indians 42.5%. For term babies (37-41 weeks) and post-term babies (42 and over weeks) Chinese have the lowest rates for low birthweight (4.3% and 3.1%) and Indians the highest (7.4% and 12.1%).

Table 3 shows analysis of birthweight by age of mother. The distribution of births shows that Malays have the highest proportion of younger mothers and Chinese of older mothers. The incidence of low birthweight falls progressively with increasing age of mother before rising again with older women (35 years and over), though the rates for these mothers do not reach those for teenage mothers; in all three ethnic groups, the lowest rate is in the age group 30-34 years (though for Chinese and Malays this is the same as for the 25-29 age group). Table 3 also shows that for very low birthweight, Indians have the largest proportions in all maternal age groups, the difference being greatest in the youngest mothers. For low birthweight the pattern is nearly consistent within all maternal age groups, Chinese having the lowest rates, then Malays, and Indians the highest rates. The only exception is older women (35 years and over) where Malays have a greater proportion than Indians.

Table 4 shows that likewise for the majority of live birth order groups Indians have the highest proportion of very low birthweight babies. For live birth order up to 3, Indians again have the highest

Table 2 *Low birthweight of live singletons by length of gestation in the ethnic groups of Singapore, 1981-3*

Gestation period (weeks)	Ethnic group	Births		Birthweight (g)%					
		No.	(%)	Under 1000	1000-1499	1500-1999	2000-2499	Under 1500	Under 2500
36 and under (pre-term)	Chinese	4782	(5.1)	1.4	3.8	9.5	25.1	5.2	39.8
	Malay	2225	(9.9)	0.8	3.0	7.5	18.7	3.8	30.0
	Indian	647	(6.7)	1.7	4.3	10.4	26.1	6.0	42.5
37-41 (term)	Chinese	84 466	(90.6)	0	0	0.2	4.0	0	4.3
	Malay	19 176	(85.6)	0	0	0.4	5.6	0	6.1
	Indian	8618	(89.6)	-	0.1	0.4	6.9	0.1	7.4
42 and over (post-term)	Chinese	3938	(4.2)	-	0	0.4	2.7	0	3.1
	Malay	989	(4.4)	-	0.1	0.2	6.0	0.1	6.3
	Indian	348	(3.6)	-	-	2.6	9.5	-	12.1

- = no births; 0 = less than 0.1%

Table 3 Low birthweight of live singletons by age of mother in the ethnic groups of Singapore, 1981-3

Age of mother (years)	Ethnic group	Births		Birthweight (g)%					
		No.	(%)	Under 1000	1000-1499	1500-1999	2000-2499	Under 1500	Under 2500
Under 20	Chinese	2233	(2.4)	0.2	0.4	1.6	8.2	0.5	10.3
	Malay	1395	(6.2)	0.1	1.0	2.0	11.1	1.0	14.1
	Indian	441	(4.6)	0.2	0.8	1.4	13.8	1.6	16.8
20-24	Chinese	21 812	(23.4)	0.1	0.2	0.7	5.4	0.1	6.4
	Malay	8189	(36.6)	0.1	0.4	1.1	7.6	0.4	9.1
	Indian	3231	(33.6)	0.1	0.5	1.5	9.3	0.5	11.3
25-29	Chinese	41 357	(44.4)	0.1	0.2	0.6	4.9	0.3	5.8
	Malay	7885	(35.2)	0.2	0.2	0.9	5.9	0.4	7.2
	Indian	3848	(40.0)	0.1	0.3	1.0	7.9	0.4	9.3
30-34	Chinese	22 172	(23.8)	0.1	0.2	0.8	4.7	0.3	5.8
	Malay	3609	(16.1)	0.1	0.3	1.2	5.8	0.3	7.2
	Indian	1703	(17.7)	0.3	0.2	1.1	6.0	0.5	7.6
35 and over	Chinese	5612	(6.0)	0.1	0.3	1.1	5.1	0.4	6.6
	Malay	1312	(5.9)	-	0.3	1.6	7.4	0.3	9.3
	Indian	390	(4.1)	-	0.5	0.5	7.4	0.5	8.5

- no births; 0 less than 0.1%

Table 4 Low birthweight of live singletons by live birth order in the ethnic groups of Singapore, 1981-3

Live birth Order	Ethnic group	Births		Birthweight (g)%					
		No.	(%)	Under 1000	1000-1499	1500-1999	2000-2499	Under 1500	Under 2500
1	Chinese	42 514	(45.6)	0.1	0.2	0.7	5.8	0.3	6.8
	Malay	9173	(41.0)	0.1	0.5	1.2	8.7	0.5	10.5
	Indian	4302	(44.8)	0.1	0.3	1.4	9.6	0.4	11.3
2	Chinese	33 248	(35.7)	0.1	0.2	0.8	4.6	0.3	5.7
	Malay	6690	(29.9)	0.2	0.3	1.0	5.8	0.4	7.2
	Indian	3322	(34.6)	0.1	0.6	1.4	7.8	0.7	9.9
3	Chinese	13 114	(14.1)	0.1	0.2	0.8	4.0	0.2	5.0
	Malay	3734	(16.7)	-	0.3	1.1	5.0	0.3	6.3
	Indian	1376	(14.3)	0.1	0.3	0.6	7.3	0.4	8.4
4	Chinese	3267	(3.5)	0.1	0.2	0.8	4.7	0.3	5.7
	Malay	1525	(6.8)	0.1	-	1.0	6.0	0.1	7.1
	Indian	411	(4.3)	-	0.7	0.5	3.9	0.7	5.1
5 and over	Chinese	1043	(1.1)	0.1	0.6	1.1	5.3	0.6	6.9
	Malay	1268	(5.7)	-	0.4	1.3	6.2	0.5	8.1
	Indian	202	(2.1)	-	-	-	3.5	-	3.5

- no births

proportion of low birthweight babies, then Malays, and then Chinese. However this does not hold for high parity women where in fact Indians have the lowest proportions.

Discussion

In this study all live singleton births in the three years 1981-3 have been examined. The World Health Organization has recommended that babies born before 37 completed weeks of gestation should be

designated "pre-term" and those of birthweight less than 2500 g "low birthweight".⁹

Table 2 shows that the proportion of babies that are pre-term are lowest in Chinese, then Indians and then Malays. Though not shown in the table, the proportions less than 28 weeks are 0.1% in Chinese and Indians, and 0.2% in Malays. It should be noted that 0.1% was the lowest proportion (for Sweden and New Zealand) found in the 1973 study by the World Health Organization.¹⁰ However, for low birthweight, table 1 shows that the lowest rate is in Chinese, then

Malays and then Indians. This pattern is consistent for all gestational periods (except pre-term when Malays have the lowest proportion, table 2). Of the low birthweight babies, the proportions that are premature are in fact lowest in Indians (28.7%), then Chinese (33.5%) and then Malays (35.2%). The pattern also holds for maternal age groups (except the oldest women, table 3) and live birth order groups (except beyond 3, table 4). The reason for this difference with older and higher parity women is not clear, but tables 3 and 4 show that the numbers of Indian births in these categories are small. These findings then confirm those found in our previous study.⁵

There is unlikely to have been any measurement bias. For 1982, hospital deliveries accounted for 98.7% of births in Chinese, 97.8% in Indians, and 89.3% in Malays; only Malays had an appreciable proportion of home deliveries (9.1%).⁶ The policy in hospital is for a nurse to weigh the newborn baby, and there are three government (admitting the vast majority of patients) and four private hospitals in Singapore for maternity cases with no differential admission by ethnic group. Hence also medical care would not seem to have contributed to the birthweight differences.

There is a social class gradient in the incidence of low birthweight,¹¹ though in the WHO study it was found not to be marked.¹² But in Singapore Indians tend to occupy a socioeconomic position between that of Chinese and Malays illustrated by the postneonatal mortality rates per 1000 live births for 1982 of Chinese 2.1, Indians 2.6, and Malays 4.4.⁶ It is known that postneonatal mortality tends to be more affected by "social" than "medical" factors.¹³ This difference in socioeconomic position is also no doubt at least partly responsible for the differences in rates of prematurity by ethnic group (table 2).¹⁴ Hence in Singapore the social gradient is reflected in prematurity but not in low birthweight.

The social class gradient in low birthweight is considered to be at least partly explained by cigarette consumption during pregnancy.¹⁵ However the rates of smoking in adult women in Singapore are relatively low, and a survey in 1975¹⁶ found that it was in fact lowest in Indians (4.1%), then Malays (4.5%), and then Chinese (9.4%). Hence smoking patterns do not account for the lack of social class gradient in birthweight. As discussed in our previous study, nutrition is not likely to be an explanation of the higher rate of low birthweight in Indians in relatively affluent Singapore.⁵ While the possibility of low birthweight being less common in some Chinese populations has been raised,⁴ it has been found here that the proportion of low birthweight babies in Indians is markedly higher than in Chinese and also

higher than in Malays. Hence in Singapore there seems to be no explanation for the higher rate of low birthweight in Indian babies, and unless some unknown environmental factor is operating it must be considered to be at least partly of ethnic/genetic origin.

This is further confirmed by looking at neonatal mortality, of which low birthweight has been found to be the major determinant at both individual¹⁷ and population levels.¹⁸ For the three years 1981-3 combined, the neonatal mortality rates per 1000 live births were: Chinese 7.1, Indians 8.7, and Malays 9.1.⁶ In other words, though Indians have a greater proportion of low birthweight babies than Malays, they have a lower neonatal mortality rate. It is interesting that in a racially mixed community in Britain (though based on hospital deliveries and small numbers with possible bias), it was shown that while Indian babies were smaller than Caucasian and West Indian babies they had in fact the lowest perinatal mortality.¹⁹

It seems therefore that these "small-for-dates" Indian babies are not necessarily less "mature". This would be fully clarified by looking at birthweight-specific neonatal mortality rates by ethnic group, but this would require the linking of birth and death certificates which is not yet available nationally in Singapore. However the data here certainly suggest that the internationally recognised weight of 2500 g used to define low birthweight should perhaps be revised downwards for Indian babies, particularly when international comparisons of the incidence of low birthweight are being made.

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