

# Morbidity Risk at Birth for Asian Indian Small for Gestational Age Infants

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Whether the traditional definition of small for gestational age (SGA) is an appropriate marker of risk for populations that have relatively lower birthweight is unclear. We determined proportions of White and Asian Indian SGA infants and those admitted to the special care nursery. Compared with White infants, Asian Indian infants were more likely to be SGA (14.5% versus 2.7%) and more likely to be admitted to the special care nursery (20.7% versus 3.7%), suggesting that traditional definitions of SGA may be applicable as a marker of risk. (*Am J Public Health*. 2010;100:820–822. doi:10.2105/AJPH.2009.165001)

Small for gestational age (SGA) usually has been defined as birthweight less than the 10th percentile for gestational age since the studies of Lubchenco and Battaglia in the 1960s,<sup>1,2</sup> which characterized size for gestational age and the risk associated with smaller size at each gestational age. SGA infants have been characterized as having increased risk of mortality, hospital admission, fetal distress, hypothermia, and hypoglycemia.<sup>2–4</sup>

The US population is becoming more diverse, with increasing numbers of individuals of Asian origin.<sup>5,6</sup> Different racial groups can have differing birthweight distributions, which may or may not be pathological.<sup>7–9</sup> Previous studies have shown that the Asian Indian population in the United States has a low-risk sociodemographic profile but a disproportionately higher number of low birthweight (LBW; <2500 g) and SGA infants compared with White women.<sup>10–12</sup> In these studies, SGA was uniformly defined across racial groups. It is unclear whether some

populations may have a disposition toward smaller babies without increased medical risk relative to absolute size.

Asian Indian newborns may be classified as SGA because of ethnic, physiological factors more so than pathological factors; thus, we hypothesized that infants of Asian Indian origin classified as SGA would be less likely to have increased morbidity compared with SGA White infants and less likely to be admitted to a special care nursery setting. Previous studies have shown that despite the increased incidence of LBW and SGA in Asian Indian infants, no corresponding increased risk of neonatal mortality was reported compared with White infants.<sup>10,13</sup> To further investigate whether the standard definition of SGA was applicable to Asian Indian infants in regard to morbidity, we investigated admission rates to the special care nursery and diagnoses according to race and birthweight status at a northern California hospital.

## METHODS

Data were collected from a community hospital in northern California with a birthrate of approximately 2900 deliveries per year. The population delivering at the hospital was racially diverse, with approximately 50% of the residents identifying themselves as Asian race. Almost all the patients had private health insurance.

In this retrospective cohort study, physicians and trained data abstractors collected data from medical charts and logbooks. Summary data were collected for all term infants born at the hospital over 2 years (from January 2006 to December 2007), including race as self-reported by the mother and disposition to well-baby nursery or special care nursery. Multiple births (n=144) were excluded from analysis. More detailed data were collected for Asian Indian and White SGA infants, including birthweight, gestational age, Apgar score, prenatal record, pregnancy history, and mode of delivery. SGA was defined as birthweight less than the 10th percentile for gestational age according to growth curves based on California births.<sup>14</sup> The following data were missing for SGA infants: length (n=60), sex (n=1), maternal age (n=1), prenatal care (n=3), and Apgar score (n=2).

The primary outcome variable was morbidity indicated by special care nursery admission. Specific morbidities, identified by reason for admission, were collected for infants admitted to the special care nursery. Analyses were computed with SAS version 9.1 (SAS Institute Inc, Cary, NC). Categorical variables were compared with the  $\chi^2$  test, with a significance level of  $P<.05$ . The Fisher exact test was used when any given group had fewer than 5 individuals. Means were compared with the 2-tailed  $t$  test. Relative risks for special care nursery admission were calculated with estimation of 95% confidence intervals (CIs). A multivariate logistic regression model with special care nursery admission as the dependent variable and race and SGA status as predictor variables was used to estimate odds ratios (ORs) with 95% CIs. Maternal age was not collected for non-SGA infants and was not included as a predictor variable in the model.

## RESULTS

During the study period, 5861 live births occurred. We limited our study to term, singleton infants of White (n=989) and Asian Indian (n=1492) race. Asian Indian infants were more likely to be SGA (Table 1). One White SGA infant experienced fetal demise. The overall special care nursery admission rate for all infants at the hospital was 11.7%. Asian Indian SGA infants were more likely to be admitted to the special care nursery than were White SGA infants. Characteristics of the SGA population are shown in Table 1.

For non-SGA infants, the special care nursery admission rate was 10.9% for Asian Indian infants and 6.8% for White infants ( $P\leq.001$ ). Mean birth weight of non-SGA admissions to the special care nursery was 3454 grams for Asian Indian infants compared with 3665 grams for White infants ( $P=.001$ ). The median birthweight was 3440 grams (range=2819–4760) for Asian Indian infants and 3616 grams (range=2870–5175) for White infants. For Asian Indian infants, the relative risk of being admitted to the special care nursery for SGA versus non-SGA infants was 1.9 (95% CI=1.4, 2.6). For White infants, the relative risk of being admitted to the special care nursery for SGA versus non-SGA infants was 0.5 (95% CI=0.1, 3.8). Multivariate logistic regression

**TABLE 1—Special Care Nursery Admission Rates and Characteristics of Small for Gestational Age (SGA) Asian Indian and White Infants at Washington Hospital: Fremont, CA, January 2006–December 2007**

	Asian Indian Infants (n = 1492)	White Infants (n = 989)	P
SGA infants, no. (%)	217 (14.5)	27 (2.7)	<.001
SGA infants admitted to special care nursery, no. (%)	45 (20.7)	1 (3.7)	.035
Non-SGA infants admitted to special care nursery, no. (%)	139 (10.9)	65 (6.8)	≤.001
Characteristics of SGA infants			
Male, %	49	30	.06
Mean birth weight, kg (SD)	2.6 (0.2)	2.5 (0.2)	.72
Mean head circumference, cm (SD)	33.6 (0.8)	33.6 (1.0)	.98
Mean length, cm (SD)	47.0 (3.9)	46.5 (2.1)	.55
Mean maternal age, y (SD)	29.9 (3.9)	28.3 (6.6)	.07
Received prenatal care, %	100	100	
Cesarean delivery, %	26	11	.08
Median Apgar score, %	9	9	
Apgar score <7, %	0	3.7	.11
Fetal distress, %	3.2	0	>.99

found that both Asian Indian race (OR=1.8; 95% CI=1.3, 2.4) and SGA (OR=2.0; 95% CI=1.4, 2.8) were independently associated with special care nursery admission.

The most common diagnoses for admissions to the special care nursery are shown in Table 2. Rates of admissions with various diagnoses differed between White non-SGA infants and Asian Indian non-SGA infants, and in general those diagnoses were less commonly seen in Asian Indian SGA infants. The most common diagnoses for Asian Indian non-SGA infants were “rule out sepsis,” “transitional changes,” and “transient tachypnea of the newborn,” accounting for more than half of admissions. Admission diagnoses for Asian Indian SGA infants were more heterogeneous than for non-SGA Asian Indian infants. Hypothermia was diagnosed in 5.5% of Asian Indian SGA infants, 0.7% of White non-SGA infants, and 0% of Asian Indian non-SGA infants.

## DISCUSSION

In our study of a community hospital in northern California, we found a high

proportion of Asian Indian SGA infants: 14.5% compared with 2.7% for White infants. Asian Indian SGA infants were more likely to be admitted to the special care nursery, suggesting that the general definition of SGA as less than the 10th percentile may be a useful indicator of risk.

Our finding of increased proportion of Asian Indian SGA infants is similar to results of previous studies. Birth certificate data from the United States show that the proportion of Asian Indian SGA infants (defined as less than the third percentile) was 5.6% to 6.3% compared with 2.6% for White infants.<sup>11</sup> In a similar population to that used in our study, the proportion of Asian Indian SGA infants (defined as less than the 10th percentile) was 15.5% compared with 4.8% for White infants.<sup>12</sup>

SGA has been widely used as a signifier of increased risk, being linked to increased mortality and morbidities such as hypothermia and hypoglycemia.<sup>3,4</sup> These and other studies have focused on White and Black infants and did not take into account the generally smaller birth-weight profiles of Asian infants. A recent study of US birth certificate data found that despite higher rates of LBW and SGA in Asian Indian infants compared with White infants, no correspondingly higher mortality rates were found.<sup>13</sup> Nevertheless, our data indicate that a uniform definition of SGA may have some utility because a relatively high proportion of Asian Indian SGA infants had significant morbidity compared with non-SGA infants.

We found that SGA infants were at risk for the common morbidities of the newborn period such as sepsis and hyperbilirubinemia and were also vulnerable to morbidities more specific to their SGA status. Although “rule out sepsis” was the most common diagnosis, it was less frequently seen in SGA infants compared

**TABLE 2—Special Care Nursery Admission Diagnoses at Washington Hospital: Fremont, CA, January 2006–December 2007**

Diagnosis	White Non-SGA (n = 65), No. (%)	Asian Indian Non-SGA (n = 139), No. (%)	Asian Indian SGA (n = 45), No. (%)
Rule out sepsis	23 (35.4)	72* (51.8)	33** (15.2)
Transitional changes	1 (1.5)	35* (25.2)	8** (3.7)
Transient tachypnea of the newborn	14 (21.5)	33* (23.7)	11** (5.1)
Feeding issues	11 (16.9)	19* (13.7)	17 (7.8)
Hypoglycemia	7 (10.8)	9* (6.5)	12 (5.5)
Hyperbilirubinemia	6 (9.2)	16* (11.5)	13 (6.0)
Meconium staining	3 (4.6)	19* (13.7)	7** (3.2)
Dehydration	3 (4.6)	18* (12.9)	6** (2.8)

Note. SGA = small for gestational age. Some patients had more than 1 diagnosis.

\*Significantly different from non-SGA White group.

\*\*Significantly different from non-SGA Asian Indian group.

with non-SGA infants. Hypothermia was diagnosed in 5.5% of Asian Indian SGA infants but rarely in non-SGA infants.

One surprising finding of our study was that Asian Indian non-SGA infants also had higher risk of special care nursery admission than did White non-SGA infants. Asian Indian mothers tend to have a relatively favorable socioeconomic profile similar to that of White mothers.<sup>10,13</sup> Although neonatal mortality risk for US-born Asian Indian infants appears somewhat favorable for their birthweight profile, a higher fetal death rate was noted compared with US-born White infants.<sup>10</sup> The reason for the seemingly higher morbidity in Asian Indian infants is unclear and needs further exploration. We found that the nonspecific diagnoses of “rule out sepsis” and “transitional changes” were the top 2 listed for Asian Indian non-SGA infants admitted to the special care nursery (Table 2).

Although population-based studies have an advantage of increased sample size to detect differences in rare outcomes such as mortality, they often lack details on common morbidities of the newborn period. In our study cohort at a single hospital, no neonatal deaths occurred, and we were not able to examine SGA as relating to mortality. However, details of the hospital course were available, and we were able to show increased special care nursery admission for Asian Indian SGA infants. Our study also was limited by the relatively small numbers of White SGA infants.

Because our study cohort was limited to a single birth hospital, the findings may not be generalizable across populations. However, because the population was relatively low risk, the findings regarding SGA status and special care nursery admission for Asian Indian infants would translate to higher-risk populations.

The implication of lower birthweights seen in Asian Indian infants and in other Asian populations is unclear. Some investigators have advocated use of race-specific birthweight percentile curves to reflect more accurately populations that may have constitutionally lower birthweights.<sup>15–17</sup> Although there may be benefit to deriving race-based birthweight percentiles because smaller size attributable to genetics and race may not be pathological, some medical risk from smaller size may affect infants across racial groups. Thus, SGA status defined as birth weight below the 10th percentile

for a diverse population may have utility in categorizing infants and racial groups at risk. We found that SGA status in Asian Indian infants, defined as birth weight less than the 10th percentile as determined from general population growth curves, conferred risk of morbidity compared with Asian Indian non-SGA infants and White non-SGA infants. Future studies on birthweight-specific morbidities may help to clarify the optimal definition of SGA in specific Asian populations. ■

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This brief was accepted June 22, 2009.

### Contributors

H.C. Lee contributed to study design, performed data analyses, and contributed to the writing of the article. P. Ramachandran contributed to study origination and design, supervised and conducted data abstraction, and edited the article. A. Madan contributed to study origination, oversaw the study design and interpretation of data, and edited the article.

### Acknowledgments

This project was supported by the NIH/NCRR/OD UCSF-CTSI (grant KL2 RR024130).

**Note.** The content of this brief is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

### Human Participant Protection

This study was approved by the institutional review board at Stanford University and the review board at the community hospital.

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