Timing of Planned Cesarean Delivery by Racial Group

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OBJECTIVE: To estimate the incidence of newborn respiratory distress syndrome (RDS) and transient tachypnea of the newborn (TTN) in relation to gestational age and planned cesarean delivery in white, South Asian, and black women.

METHODS: Included in this study were 442,596 white, South Asian, and black women who delivered single live infants at 28 of weeks gestation onwards between 1988 and 2000. Using multiple logistic regression, the gestation-specific patterns of RDS for all deliveries and RDS plus TTN for deliveries by planned cesarean delivery were analyzed by racial group. The predictors of RDS from 37 weeks of gestation onwards were determined.

RESULTS: More South Asians (28.2%, 95% confidence interval [CI] 27.8–28.6) and blacks (24.6%, 95% CI 24.0–25.1) delivered spontaneously before 39 weeks than whites (16.9%, 95% CI 16.8–17.1). Respiratory distress syndrome patterns by gestation differed significantly ($P<.001$). Compared with whites, the gestation-specific crude RDS rate was lower in South Asians up until 40 weeks and after adjusting for confounders; South Asians were most protected against RDS (odds ratio [OR] 0.6, 95% CI 0.5–0.9). The gestation-specific patterns of RDS plus TTN after planned cesarean delivery also differed significantly ($P<.001$) between racial groups. The lowest rate of TTN plus RDS was at 40 weeks for whites, but in South Asians and blacks, it was lowest at 38 weeks.

CONCLUSION: The gestation-specific patterns of RDS differed significantly by racial group from 32 weeks of gestation onwards. Preterm black infants had a lower rate of RDS when compared with whites; also, South Asians had the lowest rate of transient tachypnea until 38 weeks and the lowest rate of RDS until 40 weeks of gestation. The advantages of waiting until 39 weeks to perform planned cesarean delivery for white women are not seen in South Asians or blacks.

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LEVEL OF EVIDENCE: II

Infants born by planned cesarean delivery (before the onset of labor) have an increased risk of respiratory distress syndrome (RDS) or transient tachypnea of the newborn (TTN) when compared with infants of similar gestation who experience labor.[1,2] Respiratory distress syndrome is a manifestation of lung immaturity due to surfactant deficiency. Surfactant lowers the surface tension within the lung alveoli, facilitating gaseous exchange and preventing alveolar collapse. The criteria for RDS include respiratory distress (tachypnea, retraction, grunting, cyanosis), respiratory failure, and a typical reticulogranular chest X-ray. This syndrome presents shortly after birth, increases in severity, and persists beyond 24 hours.[3] Transient tachypnea of the newborn is due to delayed lung fluid clearance, mainly secondary to inadequate respiratory epithelial sodium ion transport and lung fluid reabsorption.[4] Although there is oxygen dependency, TTN improves within 24 hours, and the chest X-ray shows normal or reduced translucency, infiltrates, or hyperinsufflation of the lungs.[5]

The risk of respiratory dysfunction, due to either RDS or TTN, reduces significantly with advancing gestational age up to 39 weeks of gestation, reflecting increased functional maturity.[5,6] However, even at term (from 37 but less than 42 completed weeks of gestation), planned cesarean delivery increases both of these risks. This is because the onset of labor

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improves neonatal lung function, probably in response to the surge of catecholamines, endogenous steroids, and changes in oxygen tension.[7,8] Thus, the National Institute of Health and Clinical Excellence in United Kingdom recommends that planned cesarean delivery should be delayed until 39 completed weeks of gestation.[9] However, approximately 10% of women will go into labor earlier and therefore require an unscheduled cesarean delivery, increasing the risk of adverse events.[10] The optimum timing of elective procedures is a balance between the risk of respiratory dysfunction for the infant and the risk of an unscheduled operation for the mother.

However, waiting until 39 weeks of gestation for a planned cesarean delivery in black and South Asian women will likely result in a higher proportion of unscheduled cesarean deliveries when compared with white women. This is because the mean gestational length for black (women who self-reported as black British, African, or Caribbean ethnicity) and South Asian (women who self-reported as originating from India, Pakistan, or Bangladesh or other South Asian ethnic groups) racial groups was 39 weeks, whereas it is 40 weeks for the white racial group (women who self-reported as belonging to any white ethnic group).[11] An "ethnic group" is "self-assigned" based on culture, language, religion, history, geography, and skin color. A "racial group" identifies particular groups of people from different parts of the world where natural selection has resulted in the evolution of varying adaptations.

Moreover, the risk of RDS associated with earlier delivery is less likely in black infants when compared with white infants because they will be more mature for any given gestational age.[12–15] In addition, we have shown that the late pregnancy rise in the risk of antepartum stillbirth occurs earlier in South Asians when compared with whites.[16] We therefore hypothesized that, in South Asian infants, lung maturity also occurs at an earlier gestation than in white infants. The objective of this study was to investigate whether planned cesarean delivery earlier than 39 weeks of gestation is justified for black or South Asian women.

MATERIALS AND METHODS

From 1988 to 2000, data were collected prospectively from all pregnancies (585,291) booked at 15 maternity units in North West London, using the St. Mary's Maternity Information System. Data collection on 263 variables began at the first antenatal visit and continued to 28 days postpartum. Computer entry by trained clerks or midwives, using online validation, prompting, and standard definitions for clinical measurements, produced high-quality data.[17,18] In compliance with Section 60 of the Health and Social Care Act 2001 (United Kingdom), direct identifiers such as names, addresses, and hospital numbers were removed from our data set. All analyses were performed on this nonattributable data set, which contains no patient identifiers. The use of this nonattributable data set for research was approved by the Local Research Ethics Committee.

The data collected on ethnicity in the St. Mary's Maternity Information System was based on a "self-identification" measure, in line with the U.K. census. Ethnicity of the infants was based on maternal ethnicity. Using the above-mentioned classification for racial grouping, we selected white, South Asian, and black racial groups for this study, using white as the control group. Women in other racial groups were too few to study. The best estimate of gestational age at delivery was calculated using a combination of the last menstrual period and ultrasonography of the fetal size. A more detailed description of this dating method has been reported previously.[16,19] The World Health Organization (WHO) has assigned RDS an International Classification of Diseases code (ICD, versions 9 and 10), which includes hyaline membrane disease and excludes TTN, respiratory failure, and other unspecified respiratory distress of the newborn. A separate ICD code is assigned to TTN. Upon discharge from the Special Care Baby Unit, all infants' medical records and the clinicians' discharge summaries were processed by trained coding staff in the hospital's coding department. When RDS or TTN was diagnosed by the clinicians, the appropriate ICD codes were entered into the St. Mary's Maternity Information System database.

Analyses were performed using the SPSS 14.0, S-PLUS professional edition version 6.0.3 (SPSS Inc., Chicago, IL) or Microsoft Excel (Microsoft Corporation, Mountain View, CA). All RDS or TTN rates were calculated as the number of infants diagnosed with the condition per 1,000 live births. For the first analysis, we estimated the proportion of women from each racial group who were likely to have an unscheduled cesarean delivery due to labor before 39 weeks of gestation if cesarean delivery was planned at 39 weeks. We included white, South Asian, or black women who had spontaneous onset of labor and delivered, either vaginally or abdominally, a singleton infant from 37 weeks of gestation onwards. The proportion of these women who delivered before 39 weeks of gestation by racial group was calculated.

For the second analysis, we studied crude gestation-specific pattern of RDS and tested whether this

pattern differed significantly between racial groups. We included white, South Asian, or black women who delivered singleton liveborn infants weighing at least 500 g, from 28 weeks of gestation onwards. Infants born before 28 weeks usually present with apnea at birth instead of the characteristic features of RDS. Moreover, the smaller number of cases does not produce a statistically meaningful result. To test for differences between racial groups, we used likelihood ratio tests based on a logistic regression model with outcome variable RDS. The predictor variables were racial groups, using whites as control, and gestational age in completed weeks. A polynomial term of order three for gestational age and interaction terms between racial groups improved the model significantly. The final model was used to plot the gestation-specific RDS curve for each racial group.

For the third analysis, we tested whether racial group was an independent predictor of RDS. We included white, South Asian, or black women who delivered a singleton liveborn infant from term onwards. Since racial differences in birth weight may be an important confounding factor, we examined the distribution of birth weight for gestational age at birth by developing percentile weight for gestation curves specific to each racial group. Using the χ^2 and Mann-Whitney *U* tests, those variables significantly associated with RDS ($P<.05$) were selected as predictor variables for a multiple logistic regression analysis (Table 1). The *P* values were not corrected for multiple testing, but all those identified remained significant at .05, even if the conservative Bonferroni rule was applied.[20] A quadratic term for gestational age significantly improved the final model.

For the fourth analysis, we studied the gestation-specific pattern of respiratory dysfunction (RDS plus TTN) by racial group in infants delivered by planned cesarean delivery and tested whether these patterns differed significantly from one another. Because most planned cesarean deliveries were performed at 36–40 weeks of gestation, we included white, South Asian, or black women who had planned cesarean delivery at these gestations. To test the differences between racial groups, we created a logistic regression model with the outcome variable respiratory dysfunction. The predictor variables were racial groups (using interaction terms) and gestational age (using a quadratic term). For all logistic regression models, we used the Hosmer-Lemeshow test, a goodness-of-fit test, to assess the model's ability to generate predictions that are close to the actual outcome, with a null hypothesis that the predicted model is accurate.[21] A nonsignificant Hosmer-Lemeshow statistic ($P>.05$) implies a perfect (or close to perfect) fit between observed and predicted outcome.

Table 1. Multiple Logistic Regression Showing the Predictors of Respiratory Distress Syndrome From 37 Weeks of Gestation Onwards*

Variables (Reference Group)	Odds Ratio (95% CI)	*P*
No labor (spontaneous labor)	4.3 (3.3–5.5)	<.001
Maternal pyrexia (no pyrexia)	2.9 (1.8–4.5)	<.001
Meconium presence (absence)	2.1 (1.7–2.6)	<.001
Abnormal CTG (normal CTG)	2.0 (1.7–2.5)	<.001
Birth weight percentile		
Less than 10th (25th–75th)	2.0 (1.5–2.7)	<.001
Greater than 90th (25th–75th)	1.6 (1.2–2.2)	<.005
10th–24th (25th–75th)	1.6 (1.2–2.1)	<.001
Induced labor (spontaneous labor)	1.6 (1.2–1.9)	<.001
Male infant (female infant)	1.6 (1.3–1.9)	<.001
Maternal body mass index greater than 24 (20–24)	1.3 (1.1–1.6)	<.05
Increasing gestational age	0.8 (0.7–0.9)	<.001
Maternal smoking (nonsmokers)	0.7 (0.6–0.9)	<.01
South Asians (whites)	0.6 (0.5–0.9)	<.005

CI, confidence interval; CTG, cardiotocograph.

Nonsignificant variables were fetal congenital abnormality, Carstairs deprivation score, marital status, maternal age at delivery, late booking for antenatal care (beyond 19 weeks), umbilical cord prolapse, antepartum hemorrhage. Predictor variables added into the logistic regression analysis were gestational age at birth, mode of labor onset (spontaneous, induced, or none), racial group (white, South Asian, or black), maternal smoking, maternal diabetes mellitus, maternal pyrexia of unknown origin, maternal hypertensive disorders, maternal body mass index, prelabor rupture of fetal membranes, abnormal electronic fetal monitoring, meconium staining of amniotic fluid, presentation at delivery, fetal gender, and the percentile birth weight.

* Chi-square=407; *df*=19, $P<.001$; Hosmer-Lemeshow $\chi^2=9$; *df*=8; $P=.4$.

RESULTS

Of the total 585,291 cases, we excluded 16,129 cases with unknown best estimate of gestational age at birth (of which only 439 cases have a recorded birth weight of more than 500 g), 54,051 miscarriages before 24 weeks or with birth weights less than 500 g, 3,872 preterm births less than 28 weeks, 2,170 stillbirths, 13,118 multiple pregnancies, 7,490 Orientals, 11,946 Mediterraneans, 20,095 "other" ethnic group, and 13,824 cases with no record of ethnicity. The remaining 442,596 cases met the inclusion criteria; these included 348,789 (78.8%) whites, 64,187 (14.5%) South Asians, and 29,620 (6.7%) blacks. Of all women who delivered at term, the percentage who had a spontaneous onset of labor and delivered before 39 weeks was highest in South Asians (28.2%, 95% confidence interval [CI] 27.8–28.6%), then blacks

Table 2. Crude Respiratory Distress Syndrome Rates

Gestational Age in Completed Weeks	White	South Asian	Black
28–31	243.7 (474/1,945)	238.1 (105/441)	201.0 (84/418)
Odds ratio		1.0 (0.8–1.2)	0.8 (0.6–1.0)
32–36	43.7 (752/17,198)	22.0 (91/4,134)	26.4 (59/2,233)
Odds ratio		0.5 (0.4–0.6)	0.6 (0.5–0.8)
37	4.4 (85/19,342)	1.5 (8/5,339)	3.2 (7/2,184)
38	2.0 (92/46,872)	1.2 (15/12,399)	2.4 (12/5,032)
39	0.8 (65/77,472)	0.8 (13/16,636)	1.4 (10/7,062)
40	0.8 (82/97,550)	0.7 (10/14,919)	2.4 (17/7,041)
Odds ratio	(37–40)	0.7 (0.5–0.9)	1.6 (1.2–2.2)
41 or more	1.1 (93/88,410)	1.4 (14/10,319)	2.3 (13/5,650)
Odds ratio		1.3 (0.7–2.3)	2.2 (1.2–3.9)
Overall	4.7 (1,643/348,789)	4.0 (256/64,187)	6.8 (202/29,620)
Odds ratio		0.8 (0.7–0.9)	1.5 (1.3–1.7)

n, number of infants who developed respiratory distress syndrome; N, number of live births.
Values are expressed as rates per 1,000 live births (n/N). Odds ratios (95% confidence intervals) use the white racial group as reference.

(24.6%, 95% CI 24.0–25.1%), and lowest in whites (16.9%, 95% CI 16.8–17.1%).

The diagnosis of RDS was made in 2,101 infants, a rate of 4.8 per 1,000 live births. The crude RDS rate differed significantly between racial groups, with the highest rate in blacks, then whites, and lowest in South Asians (Table 2). Before 32 weeks, the crude RDS rate was lowest in blacks, followed by South Asians, and highest in whites, but the number of births was too few for the difference to be significant. At 32–36 weeks, crude RDS rates in South Asians and blacks were significantly lower than those of whites, and the lowest rate was in South Asians. Figure 1 shows that, adjusting for gestational age, the three racial groups differed significantly in their patterns of RDS from 32 weeks onwards ($P<.001$). The Hosmer-Lemeshow test showed no significant difference between the actual number of cases and the number of RDS cases predicted from the model (Hosmer-Lemeshow=7.6, $P>.05$).

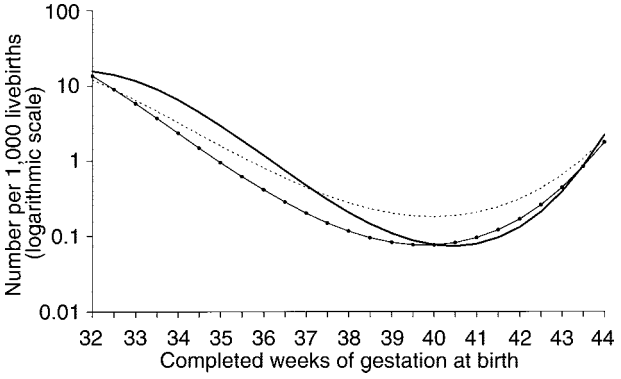

Fig. 1. Gestation-specific logistic regression model for respiratory distress syndrome by racial group. Whites, *solid line*; blacks, *dashed line*; South Asians, *line with black dots.*
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From 37 weeks onwards, RDS was diagnosed in 536 infants, a rate of 1.3 per 1,000 live births (95% CI 1.1–1.4). Black infants had the highest RDS rate. South Asian infants continued to have the lowest RDS rates until 40 weeks of gestation. In South Asians and blacks, the rate of RDS decreased with advancing gestational age until 40 weeks. Thereafter, the rate increased with advancing gestational age (Fig. 1). However, in white infants, the RDS rate continued to decline until 41 weeks. After 40 weeks of gestation, the crude RDS rate was lowest in whites, next in South Asians, and highest in blacks. Adjusting for confounders (Table 1), the absence of labor before delivery was the most significant predictor of RDS from 37 weeks onwards (odds ratio [OR] 4.3, 95% CI 3.3–5.5), while South Asians were most protected against RDS when compared with whites (OR 0.6, 95% CI 0.5–0.9).

Overall, TTN was diagnosed in 4,175 infants, a rate of 8.4 per 1,000 live births (95% CI 8.1–8.6). From term onwards, TTN was diagnosed in 3,167 infants, a rate of 6.8 per 1,000 live births (95% CI 6.5–7.0). Black infants had a significantly higher TTN rate overall, but the rates did not differ significantly between whites and South Asians (Table 3). Before 34 weeks, TTN was less commonly diagnosed than RDS, and its incidence did not differ significantly between racial groups. From 34 weeks onwards, the rate of TTN decreased with advancing gestational age until 39 weeks and then increased in all racial groups. From 34 to 38 weeks, the TTN rate was significantly lower in South Asians than in whites or blacks. From 39 weeks onwards, the rates of TTN were significantly

Table 3. Crude Transient Tachypnea of the Newborn Rates

Gestational Age in Completed Weeks	White	South Asian	Black
34	61.0 (149/2,444)	29.7 (16/538)	77.6 (25/322)
35	40.0 (168/4,193)	25.4 (26/1,022)	42.1 (22/501)
36	23.2 (188/8,090)	12.8 (26/2,026)	18.9 (19/987)
37	15.0 (290/19,342)	7.9 (42/5,339)	12.8 (28/2,184)
38	7.5 (349/46,872)	6.6 (82/12,399)	8.6 (43/5,032)
39	4.8 (372/77,472)	6.0 (100/16,636)	7.7 (54/7,062)
40	6.0 (581/97,550)	8.1 (121/14,919)	7.7 (54/7,041)
41 or more	7.0 (617/88,410)	11.3 (117/10,319)	9.4 (53/5,650)
Total from 28 weeks onwards	8.3 (2,895/348,789)	8.9 (574/64,187)	11.2 (332/29,620)
Odds ratio (34–39 weeks)		0.8 (0.7–0.9)	1.2 (1.1–1.4)
Odds ratio (40 or more weeks)		1.5 (1.3–1.7)	1.3 (1.1–1.6)
Odds ratio (overall)		1.1 (1.0–1.2)	1.4 (1.2–1.5)

n, number of infants who developed transient tachypnoea of the infant; N, number of live births.
Values are expressed as rates per 1,000 live births (n/N). Odds ratios (95% confidence intervals) use the white racial group as reference.

higher among blacks and South Asians than among whites.

The percentage of white women who had a planned cesarean delivery was 5.6% (95% CI 5.6–5.7%), South Asian 4.7% (95% CI 4.5–4.9%), and black 5.6% (95% CI 5.3–5.9%). From 36 to 40 weeks of gestation, 21,967 women had planned cesarean delivery. Of these, 17,801 (81.0%) were whites, 2,706 (12.3%) South Asians, and 1,460 (6.6%) blacks (Table 4). The number of infants with respiratory dysfunction was 493, a rate of 22 per 1,000 cesarean deliveries. Adjusting for gestational age, the patterns of respiratory dysfunction differed significantly between racial groups (Fig. 2, $P<.001$, Hosmer-Lemeshow=5, $P>.05$). For white infants, the rate of respiratory dysfunction declined significantly for each week until 39 weeks of gestation. Although the rate in white infants was lowest at 40 weeks, the difference in the rate of respiratory dysfunction between 39 and 40 weeks was nonsignificant. In South Asians and blacks, the rate of respiratory dysfunction did not differ significantly by gestational age at delivery, although the lowest rate in both groups was at 38 weeks of gestation (Fig. 2A). Thereafter, the rate increased with increasing gestational age and was higher than that of whites. In comparison with whites, the risk of respiratory dysfunction in South Asians was significantly lower at each gestation age from 36 to 38 weeks (Fig. 2B). In blacks, the risk was also lower than that of whites until 38 weeks, although this was only significant at 37 weeks (Fig. 2C).

Table 4. Numbers of Infants With Neonatal Respiratory Dysfunction After Planned Cesarean Delivery (Numbers of Planned Cesarean Deliveries)

Completed Weeks of Gestation	Whites	South Asians	Blacks
36	50 (628)	1 (115)	2 (60)
37	147 (2,834)	8 (390)	6 (256)
38	179 (8,935)	13 (1,404)	14 (712)
39	38 (3,969)	8 (587)	4 (297)
40	14 (1,435)	5 (210)	4 (135)
Total	428 (17,801)	35 (2,706)	30 (1,460)

DISCUSSION

We have shown that the gestation-specific patterns of RDS differed significantly by racial group from 32 weeks of gestation onwards. Consistent with previous reports, our study also showed that preterm black infants had a lower rate of RDS when compared with whites. In addition, South Asians had the lowest rate of TTN until 38 weeks and the lowest rate of RDS until 40 weeks of gestation. Although TTN is more frequent in term than in preterm infants, the opposite of RDS, its pattern of change with gestational age is similar to that of RDS. This is perhaps because both TTN and RDS have similar risk factors, and at the milder end of its spectrum, RDS merges into TTN. In addition, mild surfactant deficiency may play a role in TTN.[22–24]

Our study supports the findings of previous white population–based studies that, even at term, the rate of respiratory dysfunction declines with advancing gestational age. We also confirmed that, in white mothers who had planned cesarean delivery, the rate of respiratory dysfunction in their infants was significantly lower at 39 weeks of gestation, when compared with delivery at 38 weeks or less. The increased risk of respiratory dysfunction in late gestations for all racial groups, and especially in blacks from term onwards, may be due to a higher incidence of meconium passage and mild meconium aspiration.[25,26] It has been shown that meconium causes surfactant inacti-

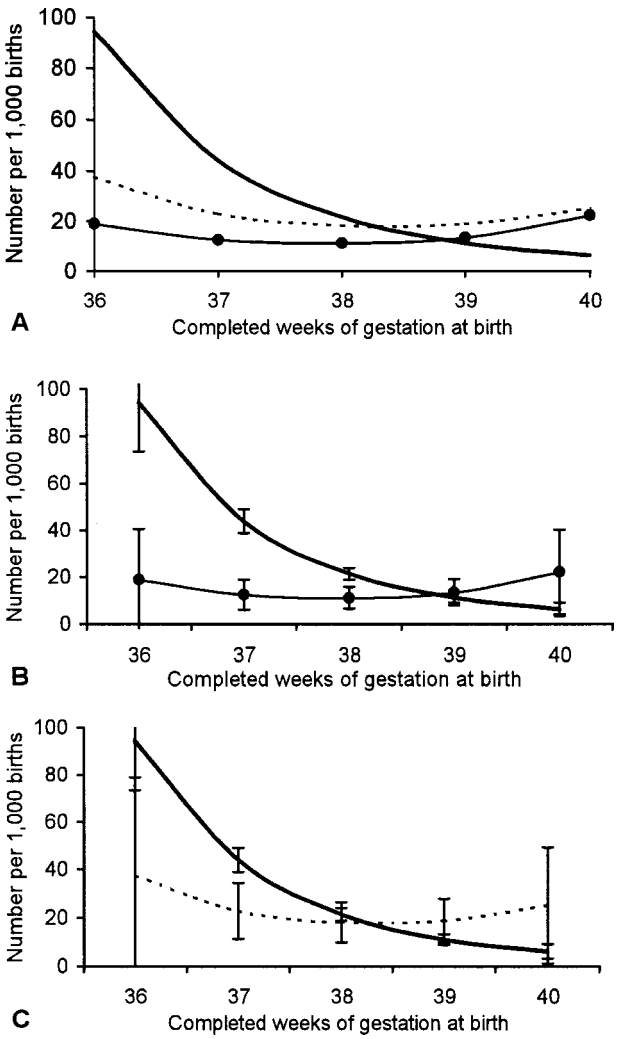

Fig. 2. Gestation-specific transient tachypnea of the newborn/respiratory distress syndrome model in infants of women who had planned cesarean delivery, comparing **(A)** all racial groups, **(B)** whites and South Asians with their 95% confidence intervals, and **(C)** whites and blacks with their 95% confidence intervals. Whites, *solid line*; blacks, *dashed line*; South Asians, *line with black dots.*

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vation.[27] The presence of meconium is also associated with poorer lung fluid clearance after birth.[28] Data on meconium staining of amniotic fluid were routinely entered as either "present" or "absent" into a variable within the St. Mary's Maternity Information System database. The overall incidence of meconium staining of amniotic fluid in black infants was 22.7% (95% CI 22.2–23.1%), South Asians 16.9% (95% CI 16.6–17.1%), and whites 15.7% (95% CI 15.6–15.8%). From term onwards, after adjusting for confounding factors (Table 1), being South Asian is protective of RDS, being black is no longer protective, and the presence of meconium staining of amniotic fluid is an independent predictor of RDS, with an odds ratio of 2.1 (95% CI 1.7–2.6).

The strength of our study is the very large number of nonwhites in the population, which produced a high statistical power for analysis. The calculation of gestational age was robust, based on a combination of the last menstrual period and ultrasonography. Although data collection was not specific for this study, most variables previously identified as risk factors for RDS could be investigated. The reported incidence of RDS varied widely between populations, possibly due to the variable criteria used for RDS, variations in the incidence of preterm birth, maternal smoking behavior, and/or cesarean deliveries, and showing a decreasing incidence over time. A potential weakness in our study is the uncertainty about the diagnoses of RDS or TTN over time and between maternity units. However, we have no evidence that there was a systematic bias in the diagnoses that would influence the patterns that we observed. The statistical properties of our data for the white population concurs with previous publications on RDS or TTN. The overall RDS rate in our study of 0.48% is lower than those of older reports (mainly before 1987), consistent with the expected reduction in respiratory morbidity with the use of prenatal corticosteroids and prophylactic surfactant treatment in preterm infants.[29] However, a lower incidence of 0.33% has been reported in a Swedish study.[30] For infants born at 37 weeks onwards, our results are similar to that of Morrison et al in 1995,[2] who reported an incidence of 2.2 per 1,000 (95% CI 1.7–2.7) for RDS and 5.7 per 1,000 (4.9–6.5) for TTN.

These patterns support a genetic variation in the rates at which infants mature, rather than an environmental effect. There is no evidence that population migration to developed nations has changed the patterns observed in the black racial group. For example, two studies from Nigeria confirmed that the mean gestational length in indigenous African women was shorter than that observed in white Europeans.[31,32] Studies which support earlier fetal lung maturity in black when compared to white infants include those conducted in the United States, Israel, and Nigeria.[12] The massive Commonwealth migration from South Asia, Africa, and the Caribbean into the United Kingdom began in the 1950s, and the majority of women of these origins in our study have lived in established communities in the United Kingdom for most or all of their lives. We have adjusted for socioeconomic factors using Carstairs score for

material deprivation, marital status, teenage pregnancy, and late booking for antenatal care. Moreover, there is equal opportunity for maternity care within the National Health Service in the United Kingdom, regardless of social class or racial group.

At term, the most important cause of RDS was planned cesarean delivery before labor. Our findings of respiratory dysfunction in white infants supports the recommendation that planned cesarean delivery should be delayed until 39 weeks in this racial group. However, in South Asian and black infants, delaying delivery until 39 weeks does not improve their risk of respiratory dysfunction. In addition, for South Asians and blacks, the onset of spontaneous labor is earlier, resulting in more unscheduled operations. If cesarean deliveries are planned at 39 weeks of gestation, the probability of an unscheduled operation due to labor, based on our data set, would be 9 per 1,000 deliveries for whites, 13 per 1,000 for South Asians, and 14 per 1,000 for blacks. This is probably an underestimate because women who had planned a scheduled cesarean delivery but who had an unscheduled cesarean delivery before their booked date cannot be identified separately in our data set. The rate of infants with respiratory dysfunction after a cesarean delivery at 39 weeks when compared with 38 weeks of gestation was 10 per 1,000 less for white infants. In contrast, for South Asian and black infants, this rate was higher by two per 1,000, and one per 1,000 deliveries, respectively. It might be more appropriate to have a separate policy of planned cesarean delivery at 38 weeks of gestation for South Asian and black women.

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