

Racial variation in the association between gestational age and perinatal mortality: prospective study

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EDITORIAL by Newnham

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BMJ 2007;334:833-5

doi: 10.1136/bmj.39132.482025.80

This article is an abridged version of a paper that was published on bmj.com on 2 March 2007. Cite this version as: *BMJ* 2 March 2007, doi: 10.1136/bmj.39132.482025.80 (abridged text, in print: *BMJ* 2007;334:833-5)

ABSTRACT

Objectives To determine if the risks of perinatal mortality and antepartum stillbirth associated with post term birth increase earlier during pregnancy in South Asian and black women than in white women, and to investigate differences in the factors associated with antepartum stillbirth between the racial groups.

Design Prospective study using logistic regression analysis.

Setting 15 maternity units in north west London from 1988 to 2000.

Participants 197 061 nulliparous women self reported as white, South Asian, or black, who delivered a single baby weighing at least 500 g at 24-43 completed weeks' gestation.

Main outcome measures Gestation specific perinatal mortality, antepartum stillbirth rates, and independent factors for antepartum stillbirth by racial groups.

Results The crude gestation specific perinatal mortality patterns for the three racial groups differed ($P<0.001$). The perinatal mortality rate among black women was lower than among white women before 32 weeks but was higher thereafter. Perinatal mortality was highest among South Asian women at all gestational ages and increased the fastest at term. After adjusting for the confounders of antepartum stillbirth (placental abruption, congenital abnormality, low birth weight, birth weight <10th centile, meconium passage, fever, maternal body mass index ≥ 30 , and maternal age ≥ 30), the excess mortality among black women after 32 weeks was not significant. After adjusting for confounding, South Asian women still had a significantly higher risk of antepartum stillbirth (1.8, 95% confidence interval 1.2 to 2.7).

Conclusions The risk of perinatal mortality increased earlier in gestation among South Asian women than among white women. The most important factor associated with antepartum stillbirth among white women was placental abruption, but among South Asian and black women it was birth weight below 2000 g.

INTRODUCTION

The complications of post term pregnancies (increased perinatal mortality and morbidity, but mainly antepartum stillbirth) have mainly been studied in white populations. Conclusions cannot necessarily be applied to different racial populations. One study found the average length of gestation for singleton pregnancies was

39 weeks for South Asian and black women and 40 weeks for white women.¹ Another study of black African women, found the average length of gestation was 38.8 weeks.² Maternal genetic factors are known to influence the length of gestation.³

Generalisations from data on white women only have led to the widespread practice of offering induction of labour to all women after 41 weeks of gestation. However, if the shorter length of gestation in South Asian and black women has a physiological basis, the likelihood of perinatal complications may increase earlier in these women. We tested this hypothesis by studying perinatal mortality according to length of gestation in white, South Asian, and black women and investigated whether the factors associated with antepartum stillbirth varied between racial groups.

METHODS

From 1988 to 2000, data on 263 variables from the first antenatal visit up to 28 days postpartum 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. Computer entry by trained clerks or midwives produced high quality data.

We studied nulliparous women who self reported as white, black, or South Asian and delivered a single baby weighing at least 500 g at 24-43 weeks of gestation. Women in other racial groups were too few to study.

Stillbirth was divided into antepartum (before labour), intrapartum (during labour), and indeterminate (uncertain timing). The early neonatal death rate is death in the first seven days of life per 1000 live births. The perinatal mortality rate is stillbirths plus early neonatal deaths per 1000 births. Perinatal mortality data were cross checked against national death registrations and the database of the Confidential Enquiry into Stillbirths and Deaths in Infancy.

The best estimate of gestational age at delivery was calculated from the first day of the last menstrual period or biparietal diameter measurements taken from fetal ultrasonography recordings made before 24 weeks of gestation.⁴

We tested the difference in perinatal mortality between racial groups using a logistic regression model with the outcome perinatal mortality and a null hypothesis that model coefficients are not different between racial groups. The predictor variables were

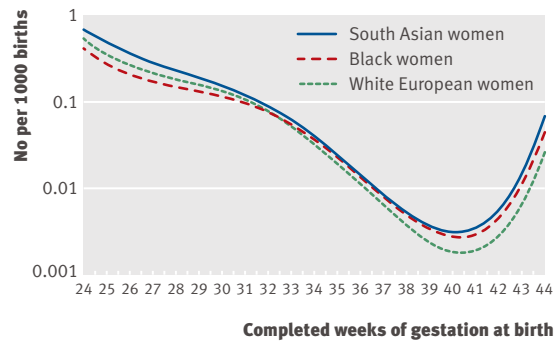


Fig 1 | Gestation specific perinatal mortality rate by racial group

racial groups, using white women as a reference, and completed weeks of gestation at birth. Interaction terms between racial groups and gestational age further improved the model. Confounding factors were not considered at this stage, as we were interested in the “real life” risk of mortality that incorporated the various risk factors associated with racial groups.

Next, we excluded preterm births from the analyses. We focused on antepartum stillbirth because this was the major component of perinatal mortality. We tested the difference in antepartum stillbirth at term and post term between racial groups using a logistic regression model with the outcome antepartum stillbirth, the predictor variables racial group and gestational age, and a null hypothesis that model coefficients are not different between racial groups.

We examined the interactions between racial group, mortality, and birth weight, and also the distribution of birth weight for gestational age for each racial group. See [bmj.com](#).

RESULTS

The maternity records of 197 016 women met the initial inclusion criteria. Of these, 81% (159 225) were white women, 13% (25 234) were South Asian, and 6% (12 557) were black. There were 1258 perinatal deaths. Of these, 71% (890) were white babies, 18% (232) were South Asian, and 11% (136) were black. The overall perinatal mortality rate was six per 1000 births; 61% of deaths were antepartum stillbirths, 10% intrapartum stillbirths, 6% indeterminate stillbirths, and 23% early neonatal deaths. The perinatal mortality rate did not

change significantly during the study period for any racial group. South Asian women had a higher rate of antepartum stillbirth, whereas black women had higher rates of antepartum stillbirth, intrapartum stillbirth, and early neonatal death than white babies (table). We found no significant difference between South Asian and black women in any categories.

In women with a reliable date for their last menstrual period, the estimated date of delivery by ultrasonography corresponded with that calculated from the last period in 94.6% of white women, 94.4% of South Asian women, and 94.0% of black women. The method of dating used was not significantly associated with perinatal mortality ($\chi^2=3$, $df=1$, $P=0.08$). See [bmj.com](#).

The racial groups differed significantly in their patterns of gestation specific perinatal mortality ($\chi^2=3472$, $df=9$, $P<0.001$; fig 1). The Hosmer-Lemeshow test, a goodness of fit statistic, showed no significant difference between the actual and model predicted numbers of perinatal deaths ($\chi^2=7$, $df=6$, $P=0.33$). South Asian women had the highest perinatal mortality rate at all times during gestation. Black women had the lowest preterm gestation specific mortality, but their overall perinatal mortality rate was the highest because they had the highest preterm birth rate (table; fig 1). Exclusion of preterm births left 183 392 cases. The racial groups differed significantly in their patterns of gestation specific perinatal mortality from term onwards ($\chi^2=85$, $df=8$, $P<0.001$; Hosmer-Lemeshow $\chi^2=3$, $df=5$, $P=0.68$).

White women and South Asian women differed significantly in their patterns of gestation specific antepartum stillbirth from term onwards ($\chi^2=81$, $df=4$, $P<0.001$; Hosmer-Lemeshow test $\chi^2=4$, $df=5$, $P=0.9$). The pattern in black women was closer to that seen in South Asian women than in white women. The antepartum stillbirth rate was lowest at 40 weeks of gestation (2 per 1000 births, 95% confidence interval 1.3 to 2.7) among South Asian women and at 41 weeks (1 per 1000 births, 0.8 to 1.2) among white women. The antepartum stillbirth rate was higher among South Asian women than among white women at all gestational times (fig 2). The predicted antepartum stillbirth rate among South Asian women was 2.7 times higher than that among white women at 41 weeks of gestation (2.6 v 1.0, 1.6 to 3.5 and 0.8 to 1.2) and 3.8 times higher at 42 weeks (4.6 v 1.2, 1.8 to 7.3 and 0.8 to 1.6).

When independent predictors of antepartum stillbirth were examined for the whole population and

Crude perinatal mortality rates (per 1000 births) and odds ratios in different racial groups (95% confidence intervals)

Type of death	White women	South Asian women		Black women	
		Mortality rate	Odds ratio	Mortality rate	Odds ratio
Perinatal mortality	5.6 (5.2 to 6.0)	9.2 (8.0 to 10.4)	1.6 (1.4 to 1.9)	10.8 (9.0 to 12.6)	2.0 (1.6 to 2.3)
Stillbirth	4.3 (4.0 to 4.6)	7.5 (6.4 to 8.5)	1.8 (1.5 to 2.1)	7.8 (6.3 to 9.3)	1.8 (1.5 to 2.3)
Antepartum stillbirth	3.3 (3.1 to 3.6)	6.2 (5.2 to 7.2)	1.9 (1.6 to 2.2)	6.3 (4.9 to 7.7)	1.9 (1.5 to 2.4)
Intrapartum stillbirth	0.6 (0.5 to 0.7)	0.5 (0.2 to 0.8)	0.9 (0.5 to 1.5)	1.2 (0.6 to 1.8)	2.0 (1.1 to 3.4)
Indeterminate stillbirth	0.3 (0.2 to 0.4)	0.8 (0.4 to 1.1)	2.3 (1.4 to 3.9)	0.3 (0.0 to 0.6)	1.0 (0.4 to 2.7)
Early neonatal death	1.3 (1.1 to 1.5)	1.8 (1.2 to 2.3)	1.3 (1.0 to 1.8)	3.1 (2.1 to 4.0)	2.3 (1.6 to 3.3)

Odds ratios use the white racial group as reference.

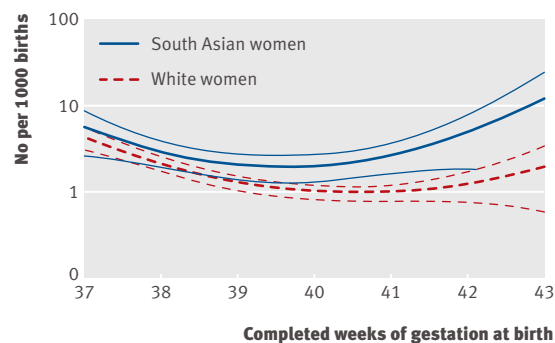


Fig 2 | Gestation specific antepartum stillbirth model; predicted estimates with upper and lower 95% confidence intervals

for the different racial groups, and potential confounders accounted for, being South Asian was an independent risk factor for antepartum stillbirth compared with being white. The overall odds of placental abruption were significantly higher in black women than in white women (odds ratio 1.3, 1.1 to 1.7), but from term onwards the difference was insignificant (0.8, 0.5 to 1.2). From term onwards, South Asian women had a lower risk of placental abruption than white women (0.6, 0.4 to 0.9). The odds of having a low birthweight baby (<2500 g) were higher in South Asian women (3.6, 3.4 to 3.9) and black women (1.7, 1.5 to 1.8) than in white women. Although deprivation was greater in South Asian and black women than in white women (3.5, 3.4 to 3.6; 5.2, 5.0 to 5.4), this did not affect perinatal mortality.

The overall odds of early neonatal death were significantly higher among black women than among white women (2.3, 1.6 to 3.3), which explains their overall higher perinatal mortality rate. This might be because the odds of preterm birth were also significantly higher among black women (1.8, 1.7 to 1.9). After 33 weeks of gestation, their odds of early neonatal death were not significantly higher than among white women (1.5, 0.8 to 2.7). The odds of intrapartum stillbirth were also significantly higher among black women (2.0, 1.1 to 3.4), possibly because of the higher incidence of congenital abnormality in black babies (1.7, 1.5 to 1.9). Excluding congenital abnormality, the odds of intrapartum stillbirth among black women were not significantly higher than among white women (1.6, 0.8 to 3.1), although this may reflect reduced statistical power.

WHAT IS ALREADY KNOWN ON THIS TOPIC

In white women, the risk of perinatal mortality is higher in post term pregnancies than in term pregnancies (as defined by the World Health Organization)

WHAT THIS STUDY ADDS

The odds of perinatal mortality were higher for South Asian women in London than for white or black women, and at term the odds increased fastest in South Asian women

The most important risk factor for antepartum stillbirth in white women was placental abruption, but the most important factor in South Asian and black women was birth weight below 2000 g

DISCUSSION

Our data for white women concur with previously published data from which the policy of inducing labour after 41 weeks' gestation was derived. Perinatal mortality patterns differed significantly with racial group. Before 32 weeks' gestation, perinatal mortality was lowest in black women, consistent with the known accelerated pulmonary maturity of fetuses in this racial group.^{5,6} At all gestational ages, perinatal mortality was highest in babies of South Asian women, and from term onwards the increase was earliest and steepest in South Asian women, followed by black women, and finally white women. Allowing for confounders, the risk of antepartum stillbirth was higher for South Asian women (but not black women) than for white women. The strongest factor associated with antepartum stillbirth in white women was placental abruption. In South Asian and black women, the strongest factor was having a baby with birth weight below 2000 g, possibly as a result of growth restriction.⁷ The differences in the incidence of placental abruption and low birth weight partly explained the differences in perinatal mortality.

An advantage of our study was the large non-white population, which gave it high statistical power. Equal opportunity for maternity care is high within the National Health Service, probably explaining why material deprivation did not significantly influence the racial patterns of perinatal mortality. Most variables previously identified as risk factors for perinatal mortality were investigated.⁸ Calculation of the estimated dates of delivery was robust, based on a combination of the last menstrual period and ultrasonography. The racial classification in this study, although crude, is a probable indicator of genetic variation in normal gestational length. Whether differences in outcome were due to social disadvantage or biology, the implications for management are the same.

We thank the midwives, medical staff, and secretarial staff of the North West Thames obstetric units who collected and entered data into the North West Thames maternity database.

Contributors: See bmj.com.

Funding: None.

Competing interests: None declared.

Ethical approval: St Mary's local research ethics committee, London.

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Accepted: 23 January 2007