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Optimal timing of near-term delivery in different ethnicities: a national cohort study

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Objective To study possible ethnic disparities in perinatal mortality and morbidity independent of the occurrence of pregnancy complications. In addition, to study the probabilities of adverse neonatal outcome for delivery, compared with 1 week of expectant management for each week of gestational age in the range of 36–42 weeks of gestation.

Design National cohort study.

Setting The Netherlands.

Population All women who were recorded as being of white European (982 318), Mediterranean (94 130), or African-Caribbean (25 253) descent with singleton cephalic births delivered between 36^{+0} and 42^{+6} weeks of gestation. Women with hypertension, pre-eclampsia, or diabetes, or with fetuses that were small for gestational age (below the tenth percentile) or with congenital abnormalities, were excluded. Data were obtained from the Netherlands Perinatal Registry (1999–2007).

Methods Numbers of antepartum and intrapartum/neonatal death, and neonatal morbidity, were expressed using the fetus/neonate-at-risk approach. For each week of gestation, we compared the probability of adverse neonatal outcome (intrapartum/neonatal death in that week) for delivery with the probability of adverse neonatal outcome for expectant management (antepartum death in that week plus intrapartum/neonatal death and morbidity in the subsequent week).

Results Women of Mediterranean and African-Caribbean descent who were near term were at increased risk of antepartum and intrapartum/neonatal death, and neonatal morbidity, compared with white European women. Expectant management from 40 weeks of gestation onwards was associated with an increased probability of adverse neonatal outcome in white European women and in women of Mediterranean descent, compared with delivery (risk ratio, RR 1.45, 95% confidence interval, 95% CI 1.25–1.68, versus RR 1.69, 95% CI 1.11–2.60, and with number needed to deliver to prevent one adverse neonatal outcome being 563 and 364, respectively). This was not observed for women of African-Caribbean descent.

Conclusions Ethnic disparities in perinatal outcomes were observed, with higher risks for women of Mediterranean descent. Expectant management in white European and Mediterranean women after 39 weeks of gestation is associated with an increased risk of adverse neonatal outcome.

Keywords Antepartum death, bad neonatal outcome, ethnicities, neonatal death, optimal timing delivery.

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Introduction

The impact of ethnicity on obstetric outcomes has gained a lot of attention in recent years. Previous studies have shown ethnic disparities in perinatal mortality,[1] morbidity, and mean duration of pregnancy,[2–4] and even differences in maturation or development between ethnicities have been described.[5–7] In addition, it is known that certain ethnicities are at higher risk for pregnancy complications such as gestational diabetes,[8,9] hypertensive disorders,[10] and growth restriction.[11] Whether disparities in perinatal outcome, including mortality and morbidity, exist independently of pregnancy complications is not known.

There is evidence guiding the decision regarding the optimal time of delivery for pregnancies complicated by

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diabetes or hypertension, but there is no evidence to guide the timing of delivery for women of specific ethnic origin who do not have pregnancy complications. Optimal timing of delivery depends on the balance between the risk of antepartum fetal death with continued pregnancy during the antepartum period and the risk to the neonate in the postpartum period.[12] Although other investigators have analysed these competing risks by week in the general population,[13,14] a comparison between women of white European, Mediterranean, and African-Caribbean descent, independent of pregnancy complications, has not been performed before.

Our objective was to explore whether there are ethnic disparities in perinatal mortality and morbidity for women without pregnancy complications. In addition, we studied the competing risks of expectant management, compared with delivery, in three low-risk ethnic groups (women of white European, Mediterranean, and African-Caribbean descent), in order to assess the optimal timing of delivery.

Methods

Database

Data were obtained from the Netherlands Perinatal Registry (PRN) between 1999 and 2007.[15] The PRN database is obtained by a validated linkage of three different registries: the midwifery registry (LVR1), the obstetrics registry (LVR2), and the neonatology registry (LNR) of hospital admissions of newborns.[16,17] The PRN registry contains population-based data on pregnancies and the care provided for newborns for 96% of all deliveries in the Netherlands [i.e. interventions, referrals, deliveries, and (re)admission]. Details on entry, linkage, aggregation, validation, and verification of the data are published elsewhere.[16,17] As the registry contains anonymous data, no ethical approval was required. The PRN gave approval for the use of data for the purpose of this study (approval number 11.86).

Inclusion and exclusion criteria

The study population comprised all singleton births delivered between 36^{+0} and 42^{+6} weeks of gestation. Although our interest was in disparities at full term, we included the 36^{th} week in case the optimal timing of delivery for one of the ethnicities turned out to be in the early term period. In addition, information for 36 weeks of gestation was necessary to accurately estimate probabilities at 37 weeks of gestation. Gestational age was based on ultrasound or the last menstrual period. We excluded women with chronic or pregnancy-induced hypertension, pre-eclampsia, and diabetes, and babies with congenital anomalies and growth restriction (defined as birthweight below the tenth percentile), because the timing of delivery could be influenced by such pregnancy complications. In addition, we excluded women with a pregnancy in non-cephalic presentation as breech position is associated with an increased risk of neonatal mortality and morbidity. To make a week-to-week comparison, enough births must be delivered each week per ethnicity in order to have enough events. As death is a rare event in the term period (two neonatal deaths per 1000 births in the Netherlands),[18] we set our limit as at least 500 births per week. Only the three main ethnic groups in the Netherlands, i.e. white European, Mediterranean, and African-Caribbean women, had enough births for accurate estimates of our outcome measures, the other ethnicities, such as South Asian women, had too few births per week and were therefore excluded.

Ethnicity

We categorised the resulting low-risk cohort into three different subclasses based on race/ethnicity of the women (throughout the article referred to as ethnicity): white European, Mediterranean, and African-Caribbean. In the PRN database the ethnicity of the women is registered on the basis of race, ethnic, and geographical background. White European women are defined as women born in the Netherlands or of West European origin. Mediterranean women consist of Turkish and North-African (mainly Moroccan) women. Most of the African-Caribbean women have their origins in the former Dutch colony Surinam, the Dutch Antilles, and sub-Saharan Africa (Somalia/Ghana). The ethnicity of women is classified by the care provider during gestation by assigning women to a predefined group.[19]

The socio-economic status (SES) indicators were created on the basis of the four-digit postcode of the pregnant woman. The SES indicators included the data from the Netherlands Institute for Social Research (SCP) in three categories (10th, 10–90th, and ≥90th percentile), and the mean household equivalent income for neighbourhoods as low and high (<40%, ≥40%).[18]

Outcome measures

We looked at four outcome measures: antepartum death; intrapartum/neonatal death; neonatal morbidity; and adverse neonatal outcome. Antepartum death was defined as all deaths occurring before the start of the delivery, whereas intrapartum/neonatal death was defined as death occurring during labour or in the first 28 days of life. We grouped intrapartum and neonatal death because most intrapartum deaths are caused by events during labour and delivery, such as cord prolapse and asphyxia.[20,21] As neonatal death is a rare event for babies born at term, we created a composite measure for 'adverse neonatal outcome' consisting of both intrapartum/neonatal death and serious neonatal morbidity.

Serious neonatal morbidity was a composite outcome that included any of the following: meconium aspiration; necrotising enterocolitis; respiratory distress syndrome; birth trauma; or intraventricular haemorrhage.

Statistical analysis

We compared baseline characteristics among the three ethnic groups using the analysis of variance (ANOVA) test for continuous variables and chi-square test for dichotomous variables. Tests were performed two-sided, and $P < 0.05$ was considered to indicate statistical significance. Gestational age-specific probabilities of births, antepartum deaths, and intrapartum/neonatal deaths were estimated using the fetuses/neonates-at-risk approach.[13,22,23] A moving average (i.e. death on any specific day plus deaths on the day before and the day after, divided by three) was applied to correct for daily fluctuations (Figure S1).

In addition, we compared the probability of death in the case of delivery versus expectant management. We compared, for each week separately, the probability of death in the case of delivery versus expectant management for one week. The number needed to deliver to prevent one death was calculated by taking the reciprocal of the absolute risk difference between delivery and expectant management for one week. Data analyses were conducted with SAS 9.2 (SAS institute Inc., Cary, NC, USA).

A detailed description of the definitions and calculations of probabilities using the fetuses/neonates-at-risk approach, and the comparison between delivery and expectant management, can be found in Appendix S1.

Results

From 1 January 1999 to 31 December 2007 a total of 1 491 534 singleton deliveries, from 36^{+0} weeks of gestation onwards, without congenital anomalies, were identified in the PRN database. We excluded women with hypertensive complications or maternal diabetes (125 865) and non-cephalic presentation (77 223), small-for-gestational-age neonates (119 923), or ethnicities other than those specified to be included in this study (66 822). After applying the inclusion and exclusion criteria, 1 101 701 deliveries made up our study population: 982 318 white European women (89.2%); 94 130 Mediterranean women (8.5%); and 25 253 African-Caribbean women (2.3%).

The maternal and neonatal characteristics of the cohort per ethnic category are shown in Table 1. More often Mediterranean and African-Caribbean women had low socio-economic status, compared with white European women (63.8, 65.4, and 18.3%, respectively; $P < 0.0001$). Deliveries were induced in 26.6% of white European women, 27.9% of Mediterranean women, and 32.5% of African-Caribbean women ($P < 0.0001$).

Table 2 presents the gestational age-specific probabilities of antepartum death and intrapartum/neonatal death for the three different ethnic groups (probabilities per day are available upon request). There were 1132 antepartum deaths in the white European women (1.2‰), which was significantly lower than the 156 deaths in the Mediterranean women (1.7‰) and 47 deaths in the African-Caribbean women (1.9‰) ($P < 0.0001$). There were 1002, 123, and 39 intrapartum/neonatal deaths in the white European (1.0‰), Mediterranean (1.3‰), and African-Caribbean women (1.6‰), respectively ($P = 0.012$). Neonatal morbidity occurred in 4053 of the white European women (4.1‰), 414 of the Mediterranean women (4.4‰), and 232 of the African-Caribbean women (9.2‰) ($P < 0.0001$). The number of women delivered at 36, 37, 38, 39, and 40 weeks of gestation was higher in the African-Caribbean women

Table 1. Baseline characteristics of the women of different ethnic groups.

	white European (n = 982 318)	Mediterranean (n = 94 130)	African-Caribbean (n = 25 253)	P*
Maternal characteristics				
Maternal age, mean (SD) (years)	30.7 (4.6)	28.2 (5.4)	27.8 (6.2)	<0.0001
Nulliparous, %	44.3	35.8	40.2	<0.0001
Low socio-economic status, %	18.3	63.8	65.4	<0.0001
Delivery characteristics				
Gestational age at delivery, weeks, median	40^{+1}	40^{+1}	39^{+6}	<0.0001
Induction of labour, %	26.6	27.9	32.5	<0.0001
Caesarean section total, %	9.0	7.5	13.5	<0.0001
Elective Caesarean section, %	3.0	2.3	3.5	<0.0001
Emergency Caesarean section (fetal distress, non-progression), %	6.0	5.2	10.0	<0.0001
Neonatal characteristics				
Male, %	51.3	51.0	51.2	0.225
Birthweight, mean (SD)	3615 (447)	3565 (431)	3463 (425)	<0.0001

*Differences in characteristics between all groups, not between each group separately.

Table 2. Gestational age-specific risks of births, antenatal deaths, and intrapartum/neonatal deaths for different ethnicities, per week

		Gestational age							
		36^0–36^6	37^0–37^6	38^0–38^6	39^0–39^6	40^0–40^6	41^0–41^6	42^0–42^6	Total
Total births, *n*	white European	20 346	48 627	126 087	233 024	298 971	199 325	55 938	982 318
	Mediterranean	1819	4678	12 341	22 880	27 838	18 394	6180	94 130
	African-Caribbean	683	1684	4130	6496	6884	3993	1383	25 253
Total births,%	white European	2.07	4.95	12.84	23.72	30.44	20.29	5.69	100.00
	Mediterranean	1.93	4.97	13.11	24.31	29.57	19.54	6.57	100.00
	African-Caribbean	2.70	6.67	16.35	25.72	27.26	15.81	5.48	100.00
Total births, cumulative%	white European	2.07	7.02	19.86	43.58	74.02	94.31	100	N.A.
	Mediterranean	1.93	6.90	20.01	44.32	73.89	93.43	100	N.A.
	African-Caribbean	2.70	9.37	25.72	51.44	78.80	94.51	100	N.A.
Live births, *n*	white European	20 189	48 462	125 870	232 827	298 755	199 188	55 895	981 186
	Mediterranean	1797	4654	12 318	22 853	27 812	18 364	6176	93 974
	African-Caribbean	673	1679	4125	6482	6878	3987	1382	25 206
Continuing pregnancies, *n*	white European	982 318	961 972	913 345	787 258	554 234	255 263	55 938	N.A.
	Mediterranean	94 130	92 311	87 633	75 292	52 412	24 574	6180	N.A.
	African-Caribbean	25 253	24 570	22 886	18 756	12 260	5376	1383	N.A.
Antepartum deaths, *n*	white European	157	165	217	197	216	137	43	1132
	Mediterranean	22	24	23	27	26	30	4	156
	African-Caribbean	10	5	5	14	6	6	1	47
Probability antepartum death/1000	white European	0.16	0.17	0.24	0.25	0.39	0.54	0.77	1.15
	Mediterranean	0.23	0.26	0.26	0.36	0.50	1.22	0.65	1.66
	African-Caribbean	0.40	0.20	0.22	0.75	0.49	1.12	0.72	1.86
Cumulative probability antepartum death/1000	white European	0.16	0.33	0.57	0.82	1.21	1.75	2.51	N.A.
	Mediterranean	0.23	0.49	0.76	1.11	1.61	2.83	3.48	N.A.
	African-Caribbean	0.40	0.60	0.82	1.56	2.05	3.17	3.89	N.A.
Intrapartum/neonatal deaths, *n*	white European	66	82	146	199	227	212	70	1002
	Mediterranean	8	13	24	16	25	28	9	123
	African-Caribbean	3	6	7	6	9	6	2	39
Probability intrapartum/neonatal deaths/1000	white European	3.27	1.69	1.16	0.85	0.76	1.06	1.25	1.02
	Mediterranean	4.45	2.79	1.95	0.70	0.90	1.52	1.46	1.31
	African-Caribbean	4.46	3.57	1.70	0.93	1.31	1.50	1.45	1.55
Composite morbidity, *n*	white European	361	408	516	657	952	850	309	4053
	Mediterranean	39	36	47	82	85	86	39	414
	African-Caribbean	12	21	29	51	59	44	16	232
Probability composite morbidity/1000	white European	17.94	8.43	4.10	2.82	3.19	4.27	5.54	4.13
	Mediterranean	21.80	7.76	3.82	3.59	3.06	4.69	6.32	4.41
	African-Caribbean	17.88	12.55	7.04	7.88	8.59	11.05	11.59	9.22

Table 2. (Continued)

		Gestational age							
		36^0–36^6	37^0–37^6	38^0–38^6	39^0–39^6	40^0–40^6	41^0–41^6	42^0–42^6	Total
Adverse neonatal outcome, *n*	white European	427	490	662	856	1179	1062	379	5055
	Mediterranean	47	49	71	98	110	114	48	537
	African-Caribbean	14	27	36	57	68	50	18	270
Probability adverse neonatal outcome/1000	white European	21.15	10.11	5.26	3.68	3.95	5.33	6.78	5.15
	Mediterranean	26.15	10.53	5.76	4.29	3.96	6.21	7.77	5.71
	African-Caribbean	20.80	16.08	8.73	8.79	9.89	12.54	13.02	10.71

compared with white European women ($P < 0.0001$ in all weeks). The composite morbidity probability was significantly higher in African-Caribbean women compared with white European women at 38, 39, 40, 41, and 42 weeks of gestation ($P = 0.007$, <0.0001, <0.0001, <0.0001, and 0.009, respectively). The composite adverse neonatal outcome among African-Caribbean women was significantly higher compared with white European women at 37, 38, 39, 40, 41, and 42 weeks of gestation ($P = 0.01$, 0.003, <0.0001, <0.0001, <0.0001, 0.006, respectively).

The probabilities are plotted in Figure 1. For each week of gestation the cumulative probability of antepartum death was highest in African-Caribbean women and lowest in white European women. The probability of intrapartum/neonatal death was also lowest in white European women and higher among Mediterranean and African-Caribbean women. The probability of neonatal morbidity was highest among African-Caribbean women.

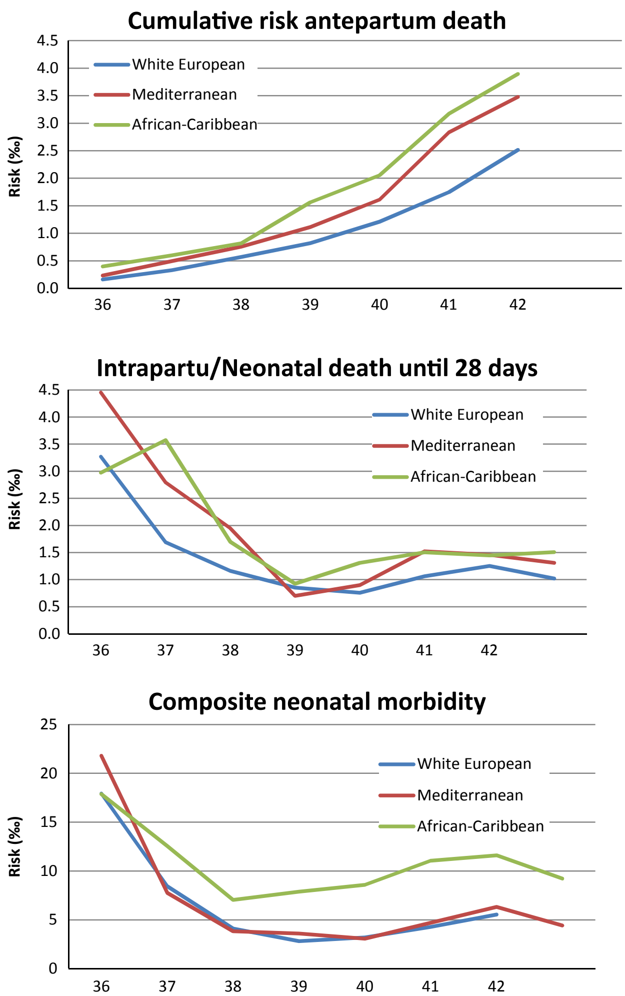

Figure 1. Risks per week of gestation for the three outcome measures among the different ethnicities.

The relative risks of adverse neonatal outcome with expectant management for one week, compared with delivery, are expressed in Table 3, as well as the numbers needed to deliver to prevent one additional case of adverse neonatal outcome (death or serious morbidity). For white European women the probabilities of adverse neonatal outcome with both delivery and expectant management are quite low. At 36, 37, and 38 weeks of gestation, expectant management is associated with significantly less adverse neonatal outcome compared with delivery (3.91 versus 5.26 per 1000, RR 0.74, 95% CI 0.64–0.87, at 38 weeks of gestation; Table 3). From 40 weeks of gestation onwards, expectant management is associated with a higher probability of adverse neonatal outcome compared with delivery (5.72 versus 3.95 per 1000, RR 1.45 95% CI 1.25–1.68). The numbers needed to deliver to prevent one adverse neonatal outcome vary from 1923 at 39 weeks of gestation to 504 at 41 weeks of gestation (Table 3).

For Mediterranean women, expectant management was associated with fewer adverse neonatal outcomes at 36 and 37 weeks of gestation. At 38 and 39 weeks of gestation the confidence intervals overlap. At 40 weeks of gestation expectant management is associated with a significantly greater number of adverse neonatal outcomes (0.90 versus 2.02 per 1000, RR 1.69, 95% CI 1.11–2.60). The numbers needed to deliver to prevent one adverse neonatal outcome ranged from 39 287 at 39 weeks of gestation to 359 at 41 weeks of gestation.

For African-Caribbean women, all confidence levels included 1.0, indicating no statistically significant difference in outcome for expectant management versus delivery. A non-significant trend was visible for expectant management at 36 and 37 weeks of gestation. From 38 weeks of gestation onwards the trend was towards lower risk of adverse neonatal outcome with delivery (9.01 versus 8.73 per 1000, RR 1.03, 95% CI 0.41–2.63, at 38 weeks of gestation). The numbers needed to deliver to prevent one adverse neonatal outcome range from 3511 at 38 weeks of gestation to 318 at 40 weeks of gestation.

The probabilities of adverse neonatal outcome and death with delivery and expectant management, with 95% confidence intervals, are listed in Tables S1 and S2, respectively; the relative risks and numbers needed to deliver when only looking at death as an outcome are listed in Table S3. The probability of death with delivery, versus expectant management, and the probability of neonatal morbidity with delivery, versus expectant management, are presented in Figure S1.

Table 3. Relative risk with 95% confidence interval and absolute risk of adverse neonatal outcome with expectant management, compared with delivery, for each week

	white European				Mediterranean				African-Caribbean			
	Relative risk	95% CI	Absolute risk difference	Number needed to deliver	Relative risk	95% CI	Absolute risk difference	Number needed to deliver	Relative risk	95% CI	Absolute risk difference	Number needed to deliver
36	**0.49**	**0.40–0.58**	−10.88	–	**0.41**	**0.25–0.68**	−15.39	–	0.79	0.35–1.78	−4.33	–
37	**0.54**	**0.45–0.64**	−4.68	–	**0.57**	**0.35–0.93**	−4.50	–	0.56	0.21–1.44	−7.15	–
38	**0.74**	**0.64–0.87**	−1.35	–	0.79	0.49–1.26	−1.21	–	1.03	0.41–2.63	0.28	3511
39	1.14	0.98–1.33	0.52	1923	1.01	0.66–1.54	0.03	39 287	1.21	0.67–2.17	1.84	544
40	**1.45**	**1.25–1.68**	1.77	563	**1.69**	**1.11–2.60**	2.75	364	1.32	0.57–3.04	3.14	318
41	**1.37**	**1.15–1.64**	1.99	504	1.45	0.97–2.16	2.79	359	1.13	0.48–2.63	1.60	625

Discussion

Main findings

Mediterranean and African-Caribbean women at full term were at increased risk of antepartum and intrapartum/neonatal death, and neonatal morbidity, compared with white

European women. Our data show that although there are ethnic disparities in the probabilities of death and morbidity, the optimal timing of delivery for white European women is 39 weeks of gestation, and for women of Mediterranean descent it is 38 and 39 weeks of gestation. For African-Caribbean women no statistically significant differences were found between both strategies, but there was a trend towards better neonatal outcome with delivery from 38 weeks of gestation onwards.

Strength and limitations

The strength of this study is the size of the cohort (1 101 701 deliveries), including women over a long but recent period (1999–2007). Data are derived from a reliable and validated linked population-based database.[16] The database includes almost all deliveries in the country (96%), and is therefore a good reflection of our population.

Although there are interesting findings from this study, there are limitations. A common weakness in studies on race or ethnicity is the classification of groups; this is difficult, and is inconsistent between studies.[24] Our registry has used the same method of categorisation for more than 15 years, with predefined groups assigned by caregivers. Whether this type of ethnicity registration is correct in current health care is debatable, as the number of babies born with multiple ethnicities has increased over time. In addition, grouping Turkish and Moroccan women as one ethnic group is questionable, and it is possible that the studied outcomes could be different for each of these groups; however, even with this rather rough subdivision by ethnic group our study shows ethnic disparities in fetal and neonatal death that could be independent of whether women have medical complications associated with pregnancy (or not).

Another limitation of our study is that the exact time of antepartum death was not known. Antepartum death could have occurred several days before the diagnosis. As a result, the probability of adverse outcome at an earlier gestational age would be higher than currently estimated. This would shift the line representing the probability of antepartum death to the left (i.e. to a lower gestational age), and possibly suggests an earlier optimal time for delivery.

Moreover, misclassification of the type of fetal death is also a weakness of the study. The exact timing of fetal death is in some cases difficult to define. The distinction between intrapartum and neonatal death is sometimes difficult to make. Combining the intrapartum/neonatal death group decreases the chance of this type of misclassification. Although most intrapartum deaths result from events caused by labour, some might be caused by events before labour. In those cases, grouping intrapartum death with neonatal death might be the wrong choice.

An additional point of discussion is the gestational age estimation. Our database does not contain information on pregnancy dating. In the Netherlands the first official dating protocol was established in 2011, and before this no uniform pregnancy dating was performed. The use of ultrasound was introduced gradually in obstetric care in the 1980s. During our study period crown–rump length and head circumference measurements increasingly replaced the last menstrual period for dating; however, no data are available on how pregnancy was dated in individual cases. As obstetric care is accessible for all inhabitants in the Netherlands, regardless of ethnicity or socio-economic status, we do not expect differences in gestational age estimation between the groups.

Ideally, this study should be performed in a population without any medical interference, to study the natural course of pregnancy; however, this is unethical. In the Netherlands, most antepartum deaths are induced; we therefore chose to include inductions as spontaneous starts of delivery. By including only spontaneous deliveries (i.e. excluding induced or operative delivery) we would introduce a selection bias by excluding the group with the largest number of antepartum deaths. Conversely, by including deliveries that were induced, we introduce a medical decision factor that could have influenced the outcome. Women who have pregnancy-related complications would probably be delivered earlier than women with uncomplicated pregnancies. We tried to correct for this by excluding all women with co-morbidities.

Furthermore, it should be emphasised that the probabilities presented are based on crude mortality and morbidity probabilities for each group, and have not been corrected for variations in all possible maternal risk factors. We tried to rule out important confounding factors for neonatal death such as pregnancy complications, growth restriction, and non-cephalic presentation. We were unable to correct for other confounding factors such as body mass index (BMI) and smoking during pregnancy because these variables are not (or are not reliably) registered in the Dutch Perinatal database. In the Netherlands, health care is in principle accessible for everybody, regardless of socio-economic status or background, and we anticipate no differences in quality of health care for different ethnic groups, which might explain the disparities in outcomes. Although access to health care is the same for everyone in the Netherlands, possibly women from non-white European backgrounds access antenatal care at later gestational ages or less frequently.

Interpretation

The rates of caesarean sections and inductions were highest in the African-Caribbean group. A previous study reported an increased risk of caesarean sections in black women, both for non-reassuring fetal heart tracings and for non-progression.[24] Although the overall rate of caesarean sections reported by Washington et al.[25] is much higher than in our cohort (20.8 versus 13.5%), we found the same trend in our data, namely that black women have a shorter mean duration of pregnancy, which has also been described in several previous articles.[1,3,4,18,26] Similarly, a lower incidence of respiratory distress syndrome and earlier development of gross motor skills have been described in black neonates.[27,28] Although all confidence intervals crossed one in African-Caribbean women, there was a non-significant trend towards less adverse neonatal outcome with delivery from 38 weeks of gestation onwards, which is earlier than in white European women.

Another group also published an abstract about ethnic differences in the risk of perinatal death. They found that at 38 weeks of gestation the risk of mortality with delivery was the same as that for expectant management in both black and white women, although the absolute death rate was doubled in black women.[29] A difference with our study is that Rosenstein et al. used infant mortality (deaths in the first year of life) instead of neonatal death. This might explain the difference in optimal week of delivery.

Conclusion

We don't know whether our observed differences are caused by genetic differences or by (un)known other confounding factors, but the implications for management are the same. Whatever the reason, our study suggests that the probabilities of antepartum and intrapartum/neonatal death in African-Caribbean and Mediterranean women is higher than in white European women, indepent of the occurrence of pregnancy complications. Therefore, we think that more attention should be paid to the ethnicity of the mother during obstetrical decision-making. Our study helps to highlight the importance of personalised medicine in both risk assessments and treatment strategies, so we can improve our ability to counsel and care for women on an individual basis.

Disclosure of interests

None of the authors have any conflicts of interest.

Contribution to authorship

BK and AR analysed the data. BK wrote the first draft of the article. CG and BM supervised the data analysis and provided important intellectual content. BM came up with the idea for this study. All authors approved the final version of the article and the submission.

Details of ethics approval

This study used anonymous registry data, so no ethical approval was needed. The PRN gave their approval for the use of the data (approval number 11.86).

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Balance between antepartum death, intrapartum/neonatal death, and neonatal morbidity in white European, Mediterranean, and African-Caribbean women.

Table S1. Probability of adverse neonatal outcome per 1000 neonates with delivery or expectant management for 1 week.

Table S2. Probability of death per 1000 neonates with delivery or expectant management for 1 week.

Table S3. Relative risks and absolute risks of death with expectant management, compared with delivery, in a certain week.

Appendix S1. Methods. ■

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