

Associations between ethnicity and obstetric intervention in New Zealand

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Abstract

Aims. To determine whether the lower rates of obstetric interventions in Maori and Pacific Island women from the New Zealand Ministry of Health obstetric procedures report in 1999 existed also in National Women's Hospital (NWH), Auckland data and if so whether they persisted after controlling for parity and obstetric risk.

Methods. The study population included 43 367 singleton, cephalic deliveries, not preceded by caesarean section at NWH from 1992-1999. Ethnicity was Maori, Pacific Island, or other. Obstetric interventions were explored at two time points: (1) at the initiation of the delivery process: induction of labour, prelabour caesarean section, or spontaneous onset of labour; and (2) at the point of delivery: either caesarean section, operative vaginal delivery, or spontaneous vaginal birth. Independent associations were found by fitting polytomous logistic regression models.

Results. 10% of the study population were Maori, 19% Pacific Islanders, and 71% other. Unadjusted analyses showed lower rates of all obstetric interventions for Maori and Pacific Island women. Adjusted analyses showed that rates of induction of labour, prelabour caesarean, and operative vaginal delivery were lower for Maori and Pacific women than for all other ethnicities grouped together. However, caesarean delivery rates overall were not different for Maori or Pacific Island women.

Conclusions. The adjusted analysis did not confirm the association seen in the New Zealand Ministry data between ethnicity and caesarean section. However, induction, prelabour caesarean section, and operative vaginal delivery were less common in Maori and Pacific Island women.

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In October 1999, the New Zealand Ministry of Health released an obstetric procedures report¹ which identified a relationship between lower rates of obstetric procedures, including induction of labour, epidural anaesthesia, episiotomy, operative vaginal delivery, and caesarean section, and Maori or Pacific Island ethnicity. Maori and Pacific Island women have higher risk pregnancies and more health problems¹ and so higher rates of obstetric intervention might be expected. The opposite finding in the Ministry report was proposed as evidence that "factors to do with preferences and expectations are playing a more significant part than clinical need".¹ The report concluded that the data "raise questions that should be addressed by clinicians in individual units".¹

The above findings raise concern. Firstly, if maternal preferences and expectations are playing an important role in obstetric interventions, then this is of relevance to the ongoing debate and concern related to the aetiology and management of rising obstetric intervention rates. Secondly, these conclusions are based on simple statistical analyses that are corrected only for maternal age, while the associations may be confounded by other factors, such as parity and clinical risk which are not accounted for.

The aim of this study was to explore whether the associations reported between ethnicity and obstetric intervention in the Ministry document were present in the National Women's Hospital (NWH) data and if so whether they persisted after controlling for potential confounding factors such as parity and obstetric risk.

Methods

The study population included the first singleton, cephalic delivery, not preceded by previous caesarean section, of women delivered at NWH, Auckland, between January 1992 and December 1999. All data were from the obstetric database at NWH. Ethnicity was categorised as Maori, Pacific Island, and 'other' for comparability with the Ministry document. Ethnicity was obtained from the booking form sent to the hospital by a private caregiver (obstetrician, general practitioner, or midwife) or filled in by the hospital midwife at the first hospital antenatal visit. Only one ethnic group was recorded per woman. All Pacific Island groups were

included together. Other ethnicities include European, Asian, and 'Other'. Obstetric interventions were explored at two time points: (1) at the initiation of the delivery process: either induction of labour (including failed induction), prelabour caesarean section (including elective caesarean before labour and emergency caesarean before onset of contractions), or spontaneous onset of labour; and (2) at the point of delivery: either caesarean section, operative vaginal delivery, or spontaneous vaginal birth. **Statistical Methods.** Univariate associations between ethnicity and obstetric interventions are presented as odds ratios (with 95% confidence intervals). Univariate associations between maternal characteristics, obstetric risk factors and ethnicity have been tested using Chi-squared tests for frequency data. Independent associations between ethnicity and obstetric interventions were explored at the two time points by fitting polytomous logistic regression models using the catmod procedure of SAS Version 6.12 (Cary, North Carolina). Polytomous logistic regression allows a logistic regression model to be fitted in a situation whether there are more than two possible outcomes, as seen here. Three models are presented for each of the outcomes; the first adjusting only for maternal age (as in the Ministry document), the second adjusting for age and parity, and the final model adjusting for a larger selection of confounders (as listed in the Results). Variables were included in the final models for a priori reasons, and then removed by manual backward selection if they were insignificant ($p > 0.05$) and were not important confounders (ie, did not alter the parameter estimates for ethnicity by more than 10%). The variables included in the models were defined as follows: parity was either nulliparous or multiparous; smoking included any smoking before or during pregnancy; gestation at hospital booking for a public patient was the gestation the patient first visited the hospital and for a private patient was either the gestation at the first visit or the gestation at which details of booking were entered onto the hospital database; caregiver was public, private general practitioner, private midwife, private obstetrician, and some women were unbooked; transfer was transfer of care from booking at another facility to NWH prior to birth; hypertension included women with a history of essential hypertension or diastolic blood pressure > 90 mmHg in pregnancy; diabetes included pre-existing and gestational diabetes; antepartum haemorrhage was any bleeding after 20 weeks gestation; small for gestational age was birthweight less than the 3rd percentile for gestational age;² preterm was birth < 37 completed weeks gestation; postterm delivery was delivery at or after 41 completed weeks gestation.

Results

There were 66 952 deliveries at NWH between January 1992 and December 1999. The study sample includes the first eligible pregnancy of 43 367 women who had singleton,

cephalic deliveries, without previous caesarean section. Of these pregnancies, 4361 (10%) mothers were Maori, 8197 (19%) were Pacific Islanders, and 30 809 (71%) were of other ethnicities. The unadjusted associations between ethnicity and obstetric interventions are presented in Table 1 as rates and odds ratios, showing the significantly lower intervention rates in Maori and Pacific Island women compared to all other ethnicities together.

Table 1 presents unadjusted and adjusted associations between ethnicity and each intervention. The odds ratios for induction of labour for Maori and Pacific Island women compared to all others increase towards one (or no effect) with adjustment for age and parity, highlighting that Maori and Pacific Island women have their babies younger and have more babies. However, adjusting for other confounders, including obstetric risk factors, reduces these odds ratios again and results in significantly lower rates in Maori and Pacific Island women compared to 'other'.

The associations between ethnicity and prelabour caesarean show similar patterns to the associations with induction, with attenuation of the association after adjusting for the increased age and increased rate of nulliparity of 'other' ethnicities, but persistence of reduced odds (approximately 40%) of prelabour caesarean after controlling for other factors.

The attenuation, after controlling for age and parity, of the large odds of operative vaginal delivery for Maori and Pacific Island women compared to other ethnicities shows again that older age and nulliparity (as seen in the 'other' ethnicities group) are associated with increased intervention rates. However, the marked reduction in odds (30 and 50%) for Maori and Pacific Island women persists after controlling for other obvious risk factors.

The association between ethnicity and caesareans (including prelabour and emergency) is attenuated by age and parity to one, and although there is some reduction in the odds ratio with adjusting for other risk factors, there is no significant difference in caesarean section rate for Maori or Pacific Island women compared to other ethnicities.

Table 2 shows unadjusted associations between maternal characteristics, obstetric risk factors, perinatal outcomes and ethnicity. There were significant associations between

ethnicity and: age, parity, smoking, gestation at booking, booking caregiver, transfer of care, small for gestational age birth, hypertensive disease, diabetes, antepartum haemorrhage, gestation at delivery and birthweight. Maori and Pacific Island women were less likely to have epidural analgesia.

Discussion

This analysis was prompted by concern at the findings of the Ministry of Health document (1999) which revealed lower rates of obstetric intervention in women of Maori or Pacific Island ethnicities.¹ In the current study, unlike that of the Ministry, it was possible to control for age and parity and for a number of potential confounders in the complex relationship between ethnicity and obstetric intervention. Comprehensive prospective national perinatal data collection would allow this type of analysis to be performed centrally resulting in more informative presentation of national data.

Our data show that rates of induction of labour, prelabour caesarean, and operative vaginal delivery are much lower for Maori and Pacific women than for all other ethnicities grouped together, even after controlling for measurable differences between the groups. However, caesarean delivery rates overall are not different for Maori or Pacific Island women compared with 'other' women. The observed unadjusted differences in caesarean section rate associated with ethnicity are attributable to age and parity differences. Maori and Pacific Island women have lower rates of prelabour caesarean which are compensated for by higher rates of emergency caesarean.

The findings of this analysis are limited by the data available within the NWH database. It was not possible to look at the potential confounding effect of maternal weight because of missing data. Nor was it possible to look at the temporal relationship between epidural analgesia and obstetric intervention as the data regarding dilatation and time at insertion of an epidural are not currently collected.

Previous reports of the associations between ethnicity and caesarean section rate in New Zealand have been unadjusted for the important confounders controlled for here (especially age and parity) and their findings have therefore been similar to those of the Ministry report.³⁻⁵

Table 1. Associations [OR (95% CI)] between ethnicity and induction of labour, prelabour caesarean section, operative vaginal delivery, and caesarean section.

Outcome	Ethnicity	N/total n	Rate (%)	Unadjusted model OR (95% CI)	Age adjusted model OR (95% CI)	Age and parity adjusted model OR (95% CI)	Final model* OR (95% CI)
Induction of labour†	Other	8749/30 809	28.4	Referent	Referent	Referent	Referent
	Maori	1091/4361	25.0	0.83 (0.77-0.89)	0.87 (0.80-0.94)	0.96 (0.89-1.04)	0.85 (0.78-0.93)
	Pacific Islander	1791/8197	21.9	0.69 (0.65-0.73)	0.71 (0.59-0.85)	0.78 (0.73-0.83)	0.69 (0.64-0.74)
Prelabour caesarean†	Other	960/30 809	3.1	Referent	Referent	Referent	Referent
	Maori	103/4361	2.4	0.71 (0.58-0.88)	0.86 (0.69-1.07)	0.97 (0.78-1.20)	0.57 (0.43-0.75)
	Pacific Islander	150/8197	1.8	0.53 (0.44-0.63)	0.59 (0.49-0.70)	0.65 (0.54-0.78)	0.58 (0.46-0.72)
Operative vaginal delivery‡	Other	5971/30 809	19.4	Referent	Referent	Referent	Referent
	Maori	406/4361	9.3	0.39 (0.35-0.44)	0.42 (0.38-0.47)	0.69 (0.62-0.78)	0.71 (0.63-0.81)
	Pacific Islander	598/8197	7.3	0.31 (0.28-0.33)	0.32 (0.29-0.35)	0.49 (0.45-0.54)	0.50 (0.45-0.56)
Caesarean section‡	Other	4825/30 809	15.7	Referent	Referent	Referent	Referent
	Maori	485/4361	11.1	0.58 (0.52-0.64)	0.67 (0.60-0.74)	1.04 (0.93-1.16)	0.93 (0.82-1.06)
	Pacific Islander	1033/8197	12.6	0.65 (0.61-0.70)	0.71 (0.66-0.76)	1.03 (0.95-1.12)	0.94 (0.85-1.03)

*Induction of labour and prelabour caesarean final models adjusted for age, parity, smoking, hospital booking before 24 weeks, booking caregiver, transfer, obstetric risk factors (hypertension, diabetes, SGA, APH), postterm delivery (41+ weeks), and birthweight. Operative vaginal delivery and caesarean section final models adjusted for age, parity, smoking, hospital booking before 24 weeks, booking caregiver, transfer, obstetric risk factors (hypertension, diabetes, SGA, APH), preterm delivery (<37 weeks), postterm delivery (41+ weeks), and birthweight. †Odds ratios present odds of induction of labour or prelabour caesarean versus spontaneous onset of labour for Maori or Pacific Island women compared to the odds for all other ethnicities. ‡Odds ratios present odds of operative vaginal delivery or caesarean section versus spontaneous vaginal delivery for Maori or Pacific Island women compared to the odds for all other ethnicities.

Table 2. Univariate associations between maternal characteristics, obstetric risk factors, perinatal outcomes, and ethnicity.

	Maori n=4361		Pacific Island n=8197		Other n=30 808		p
Age (yrs)							
<20	946	22%	817	10%	1191	4%	
20-24	1402	32%	2320	28%	4176	14%	
25-29	1025	23%	2514	31%	9259	30%	
30-34	626	14%	1616	20%	10 678	35%	
35-39	287	7%	730	9%	4648	15%	
≥40	75	2%	200	2%	856	3%	≤0.001
Nulliparous	2260	52%	4046	49%	20 514	67%	≤0.001
Smoker*	2393	62%	2080	28%	5237	19%	≤0.001
Booked before 24 wks	2734	67%	4601	56%	23 741	77%	≤0.001
Booking caregiver†							
Public	2582	59%	5506	67%	9516	31%	
Private obstetrician	121	3%	149	2%	7626	25%	
General practitioner	911	21%	1628	20%	9051	29%	
Independent midwife	626	14%	742	9%	4348	14%	
Unbooked	98	2%	143	2%	115	0.4%	≤0.001
Transfer	621	14%	579	7%	2505	8%	≤0.001
Small for gestational age	175	4%	151	2%	1034	3%	≤0.001
Hypertensive disease	446	10%	933	11%	2682	9%	≤0.001
Diabetes (any type)	101	2%	314	4%	688	2%	≤0.001
Antepartum haemorrhage	244	6%	328	4%	1425	5%	≤0.001
Gestation at delivery							
Preterm (<37 wks)	504	12%	498	6%	2626	9%	≤0.001
Postterm (≥41 wks)	811	19%	1790	22%	6918	22%	≤0.001
Birthweight							
<1000g	57	1.3%	51	0.6%	263	0.9%	
1000-1999g	167	3.8%	121	1.5%	697	2.3%	
2000-2999g	1043	24%	1014	12%	6303	20%	
3000-3999g	2634	60%	5426	66%	20 028	65%	
4000-4999g	454	10%	1537	19%	3479	11%	
≥5000g	6	0.1%	48	0.6%	38	0.1%	≤0.001
Epidural analgesia	1445	33%	2460	30%	15 574	51%	<0.001

*Smoking status unknown = 4679. †Private unknown caregiver = 205.

Similarly, a recent paper from New South Wales showed indigenous women had lower unadjusted rates of obstetric interventions (induction of labour, planned caesarean section, epidural, caesarean after labour, instrumental delivery, and episiotomy).⁶ More interesting analyses have adjusted for confounding factors. A recent analysis from Adelaide reported an association between non-Caucasian ethnicity and lower rates of induction or elective caesarean section, but not with caesarean section after labour.⁷ A Californian study showed lower rates of caesarean among Blacks compared to Whites in unadjusted analyses, but higher rates among Blacks in the adjusted analyses.⁸ A further North American publication, from Alabama, showed lower rates of caesarean section for Blacks in unadjusted analyses, but no difference after adjusting for sociodemographic and obstetric/medical risk factors.⁹ White non-Hispanics had a higher rate of induction of labour than all other ethnic groups after controlling for clinical factors (including age, parity, and medical/obstetric risk factors) in a study from Arizona.¹⁰ There is a lack of published adjusted data on the association between ethnicity and obstetric interventions other than caesarean section.

If we assume that this multivariate analysis controls for most clinical and other differences that might affect the association between ethnicity and obstetric intervention, then we expect that the odds ratios for obstetric

intervention in the final models would be one for all ethnic groups. That this is true for total caesarean section shows that ethnicity is not associated with caesarean section rates which suggests that caesarean section is performed for perceived 'clinical need'. Conversely, that the odds ratios for Maori and Pacific Island women for induction of labour, prelabour caesarean, and operative vaginal delivery are significantly less than one suggests that other factors may play a role. Lower rates of epidural analgesia for Maori and Pacific Island women may partly explain the lower rate of operative vaginal delivery, as randomised trials have shown that epidural analgesia increases operative vaginal delivery rate.¹¹ Access to care in this urban population probably does not explain the differences in these analyses as gestation at booking (defined as before or after 24 weeks) was included as a variable in the multivariate models.

Further elucidation of the reasons for disparity in obstetric interventions by ethnicity might involve qualitative methodology such as focus groups. If it is found that women are making the decisions which are leading to increases in interventions without proven benefits, they deserve education to allow them to make well informed decisions.

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1. New Zealand Ministry of Health Obstetric Procedures 1988/89-1997/98, 1999. <http://www.moh.govt.nz>
2. Beeby PJ, Bhutap T, Taylor LK. New South Wales population-based birthweight percentile charts. *J Paediatr Health* 1996; 32: 512-8.
3. Linton M, Borman B, Findlay J. Caesarean section: a national study. *NZ Med J* 1988; 101: 534-5.
4. Johnson NP, Lewis J, Ansell DA. Does ethnicity influence obstetric intervention? *NZ Med J* 1995; 108: 511-2.
5. Bulger T, Howden-Chapman P, Stone P. A cut above: the rising Caesarean section rate in New Zealand. *NZ Med J* 1998; 111: 30-3.
6. Roberts CL, Algert CS, Peat B, Henderson-Smart D. Differences and trends in obstetric interventions at term among urban and rural women in New South Wales: 1990-1997. *Aust NZ J Obstet Gynaecol* 2001; 41: 15-22.
7. Jonas O, Roder D, Chan A. The association of maternal and socioeconomic characteristics in metropolitan Adelaide with medical, obstetric and labour complications and pregnancy outcomes. *Aust NZ J Obstet Gynaecol* 1992; 32: 1-5.
8. Braveman P, Egerter S, Edmonston F, Verdon M. Racial/ethnic differences in the likelihood of cesarean delivery, California. *Am J Public Health* 1995; 85: 625-30.
9. Woolbright LA. Why is the cesarean delivery rate so high in Alabama? An examination of risk factors, 1991-1993. *Birth* 1996; 23: 20-5.
10. Coonrod DV, Bay RC, Kishi GY. The epidemiology of labor induction: Arizona, 1997. *Am J Obstet Gynecol* 2000; 182: 1355-62.
11. Howell CJ. Epidural versus non-epidural analgesia for pain relief in labour (Cochrane Review). In: *The Cochrane Library*, Issue 1, 2001. Oxford: Update Software.