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Gender specific intrapartum and neonatal outcomes for term babies

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ABSTRACT

Objective: The purpose of this study is to document the gender specific intrapartum and neonatal outcomes in term, singleton, appropriately grown babies.
Study design: De-identified, routinely collected data of all women meeting inclusion criteria between 2001 and 2011 were examined ($n = 9223$). Inclusion criteria were public (non-insured), primiparous women who had delivered singleton, appropriately grown babies at term. In this retrospective cohort study, we estimated 95% confidence intervals. Outcomes measured were maternal demographics, mode of delivery, birthweight, APGAR score, cord blood acidemia, respiratory distress, any resuscitation requirement, nursery admission and stillbirth rates.
Results: The sex ratio of male babies was 1.05:1 (4718 males; 4505 females, $p = 0.85$). Male babies were more likely to be delivered by instrumental ($p = 0.004$) or caesarean ($p < 0.001$). Birthweight was found to be a significant influencing factor on mode of delivery. Even after adjusting for birthweight, male babies were more likely to be delivered by instrumental delivery (OR 1.24, $p < 0.001$), as well as by emergency caesarean for failure to progress (OR 1.24, $p = 0.04$) and fetal distress (OR 1.38, $p < 0.001$). Male babies, despite having greater birthweights than female babies ($p < 0.001$), were more likely to have lower APGAR scores at 5 min ($p = 0.004$), require neonatal resuscitation ($p < 0.001$), develop respiratory distress ($p = 0.005$) and require nursery admission ($p < 0.001$). No statistical difference between male and female babies was found for cord blood acidemia ($p = 0.58$) or stillbirth ($p = 0.49$).
Conclusion: This large cohort study demonstrates that term, appropriately grown male babies in primiparous pregnancies fare more poorly in the intrapartum and neonatal periods than female babies. Even when birthweight was accounted for, male babies still required higher rates of intervention in the intrapartum and neonatal periods. This suggests gender may play an independent role in influencing pregnancy outcomes, although the underlying contributing physiology is not definitively established. The gender of the baby perhaps should be considered when counselling parents in the antepartum period.

Introduction

With the exception of socially skewed birth ratios seen in some countries, the sex ratio at birth is surprisingly constant across different populations with 105–107 male births for every 100 female births [1]. Numerous demographic and environmental factors are believed to influence the sex ratio at birth [1]. Although the sex ratio at birth favors more male babies, the population sex ratio (the number of males to 100 females in the population) is reduced to 97.9–100.3 [2], which has been attributed to subsequent increased male mortality [3] and in Australia at least, greater overall female life expectancy [4].

Although more male babies are born, their perinatal and obstetric outcomes are substantially worse than for female babies [5]. Male babies are more likely to be associated with placental pathology disorders such as pre-eclampsia and placental abruption [6,7], as well as preterm delivery and caesarean delivery [5]. The longer-term outcomes are also affected with preterm male babies having substantially worse neurological outcomes than female babies [8], including moderate to severe cerebral palsy [9]. Furthermore, in dichorionic twin pregnancies, the presence of a male co-twin is independently associated with worse neonatal outcomes [10].

However, there is a gap in the literature exploring the gender specific intrapartum and neonatal outcomes for term, singleton,

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Table 1
Maternal demographics for male and female babies.

Characteristic	Total	Male babies	Female babies	*p* Value
Number of women	9223 (100)	4718 (51.2)	4505 (48.8)	0.85
Maternal age*, median (range)	26.6 (18–40)	26.7 (18–40)	26.5 (18–40)	0.19
Maternal BMI*, (range)	23.7 (14.02–63.06)	23.7 (14.02–63.06)	23.7 (14.33–58.46)	0.78
Maternal smoking	3412 (37)	1734 (50.8)	1678 (49.2)	0.7
Maternal ethnicity	(100)			
Caucasian (%)	6273 (68)	3229 (51.5)	3044 (48.5)	0.61
Asian (%)	1238 (13.4)	641 (51.8)	597 (48.2)	0.64
ATSI (%)	201 (2.2)	83 (41.3)	118 (58.7)	0.005
Other (%)	1511 (16.4)	765 (50.6)	746 (49.4)	0.66

All values are numbers (%) except * = age (years), BMI (kg/m^2); BMI—body mass index; ATSI—Aboriginal and Torres Strait Islander.

appropriately grown babies. Many of the larger institutional or population based studies have not differentiated between preterm and term deliveries and it is not clear if the differences in adverse outcomes are confounded by the worse outcomes in the preterm cohorts. The aim of this study was to describe the differences in intrapartum and neonatal outcome variables between appropriately grown male and female babies at term, in primiparous women.

Materials and methods

This was an 11 year retrospective cohort study conducted at Mater Mothers' Hospital (MMH). MMH is one of two large perinatal tertiary referral centers in South East Queensland, Australia. Prospectively entered, routinely collected, de-identified data from the MMH's electronic maternity database, MatriX (Meridian Health Informatics, Surry Hills, New South Wales, Australia) were used. Ethics approval was obtained from the Mater Medical Research Institute (MMRI) Human Research Ethics Committee (reference number: EC00332).

Data were collated for public (non-insured), primiparous women aged between 18 and 40 years who had delivered appropriately grown, singleton babies at term (37–42 weeks) from January 2001 to December 2011.

Exclusion criteria included maternal age <18 or >40 years, gestation <37 weeks or >42 weeks, multiparity, multiple pregnancy, neonatal congenital anomaly or syndrome, birth weight <10th centile (<2500 g; Roberts and Lancaster [11]) and privately insured patients.

Maternal demographics analyzed were: age, body mass index (BMI), ethnicity and smoking status at booking. Intrapartum outcomes recorded included mode of delivery and indication for caesarean or instrumental delivery. Neonatal outcomes obtained from the obstetric database were sex, birthweight, APGAR scores at 5 min, cord arterial pH <7.20, any resuscitation requirement, respiratory distress (as diagnosed by the attending pediatrician), neonatal nursery admission and stillbirth.

Statistical analysis was performed using Prism and Stata statistical software. Continuous and categorical variables were compared between groups using *t*-tests and Chi-squared tests, respectively. For continuous variables, non-parametric methods were used when appropriate. Logistic regression analyses were used to determine odds ratios (ORs) when controlling for possible confounders.

Results

Of the total 90,802 deliveries at MMH over the course of the study, 9223 women met the inclusion criteria for this study (Table 1). The median maternal age was 26.6 years (range 18–40) and the median maternal BMI was 23.7 kg/m^2 (range 14.02–63.06). Of the women included in the study, 3411 (37%) smoked, similarly distributed between mothers of male and female babies (50.8% vs 49.2%, $p = 0.7$). Women of Caucasian ethnicity comprised 6273 (68%) of the sample and 201 (2.2%) identified as Aboriginal or Torres Strait Islander (ATSI). The female to male sex ratio at birth for ATSI women was significant (58.7% vs 41.3%, $p = 0.005$).

The overall male to female sex ratio at birth was not significant (1.05:1, 4718 males: 4505 females, $p = 0.85$) although significant gender differences existed for intrapartum outcomes (Table 2). Female babies were more likely to be born by normal vaginal delivery (NVD) (52.3% vs 47.7%, $p < 0.001$). More male babies required instrumental delivery (54.4% vs 45.6%, $p = 0.004$), including vacuum (57.6% vs 42.4%, $p = 0.007$) and forceps (59.9% vs 40.1%, $p = 0.04$) deliveries for failure to progress in the second stage. Of total deliveries, there were 2145 (23.3%) caesarean deliveries, of which 89.8% were emergency. More male babies required caesarean delivery (56.7% vs 43.3%, $p < 0.001$), including emergency caesarean for suspected fetal distress (57% vs 43%, $p = 0.002$) and for failure to progress (58.5% vs 41.5%, $p < 0.001$).

Table 2
Comparison of mode of delivery between male and female babies.

Mode of delivery	Number	Male babies	Female babies	*p* Value
Total	9223 (100)	4718 (51.2)	4505 (48.8)	0.89
NVD	5183 (56.2)	2472 (47.7)	2711 (52.3)	<0.001
Instrumental delivery	1895 (20.5)	1030 (54.4)	865 (45.6)	0.004
Vacuum	1510 (16.4)	824 (54.6)	686 (45.4)	<0.001
FTP	425 (4.6)	245 (57.6)	180 (42.4)	0.007
Forceps	385 (4.2)	206 (53.5)	179 (46.5)	0.35
FTP	137 (1.48)	82 (59.9)	55 (40.1)	0.04
Caesarean section	2145 (23.3)	1216 (56.7)	929 (43.3)	<0.001
Elective	218 (10.2)	123 (56.4)	95 (43.6)	0.12
Emergency	1927 (20.1)	1093 (56.7)	834 (43.3)	<0.001
Suspected fetal distress	700 (7.58)	399 (57)	301 (43)	0.002
FTP	961 (10.4)	562 (58.5)	399 (41.5)	<0.001

All values are numbers (%); NVD—normal vaginal delivery; FTP—failure to progress.