



Is there an association between fetal sex and stillbirth?

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Background

In Australia, 1 in 137 pregnancies that reach 20 weeks' gestation will end in stillbirth. Unlike maternal and neonatal mortality rates, stillbirth rates have remained virtually unchanged for the last two decades.

Causes of stillbirth are extremely heterogeneous and targeting risk factors is therefore integral in reducing the rate of stillbirth.

The association between fetal sex and stillbirth remains unclear. Published evidence is conflicting, with some studies suggesting that male fetuses experience higher rates of stillbirth than females.

Objectives

Our study aimed to a) assess contemporary rates of stillbirth amongst a large, state-wide Victorian cohort, b) examine the association between fetal sex and stillbirth and c) explore other major risk factors for stillbirth between male and female fetuses in this Victorian cohort.

Methods

We obtained data from the Consultative Council on Obstetric and Paediatric Mortality and Morbidity on all births in Victoria between 2009 and 2014. Exclusion criteria included pregnancies <24/40 gestation, multiple pregnancies and fetuses with known congenital anomalies.

We examined univariate associations between male and female fetuses across the total cohort. Analysis was performed using chi-square tests for categorical variables and Student's t-test for continuous, normally distributed variables.

Separately, we analysed the sub-cohort of stillbirths, to further investigate associations between potential risk factors and fetal sex.

We examined rates of SGA (small for gestational age) by fetal sex within the stillbirth cohort, using both a population birthweight chart (Dobbins) and the Intergrowth-21st fetal growth chart. We defined SGA as <5th centile and compared these fetuses to AGA (appropriate for gestational age) babies, defined as 10th-90th centile.

Statistical analysis was performed using Stata version 15.

Results

The study cohort included 389 419 births and 1134 stillbirths; representing a stillbirth rate of 2.8 per 1000 births.

We found no significant difference in the rate of stillbirth between male and female fetuses (p=0.5) (Table 1).

The distribution of male and female fetuses across gestational age categories was significantly different, however, we found no difference between male and female fetuses with respect to parity, maternal age and BMI.

Table 1. Descriptive statistics of total cohort by fetal sex

	Female N= 195 433		Male N= 202 986		P-value
Liveborn	194 888	(99.72%)	201 395	(99.71%)	0.50
Stillborn	545	(0.28%)	589	(0.29%)	
Nulliparous	86 237	(44.13%)	89 795	(44.24%)	0.48
Multiparous	109 160	(55.87%)	113 157	(55.76%)	
Gestational age*					
24 - 27	432	(0.22%)	486	(0.24%)	<0.001
28 - 33	1 990	(1.02%)	2 507	(1.24%)	
34 - 36	7 979	(4.08%)	9 343	(4.60%)	
37 - 41	183 337	(93.81%)	188 871	(93.05%)	
≥42	1 695	(0.87%)	1 779	(0.88%)	
Maternal age [^]	30.71	(5.42)	30.70	(5.42)	0.41
BMI [¶]					
<18.5	5 322	(2.72%)	5 418	(2.67%)	0.56
18.5 - <25	88 224	(45.14%)	91 437	(45.05%)	
25 - <30	46 657	(23.87%)	48 464	(23.88%)	
≥30	55 230	(28.26%)	57 667	(28.41%)	

*completed weeks [^] by year (continuous) [¶]kg/m²

Table 2. Stillbirth cohort by fetal sex

	Female N= 545	Male N= 589	P-value
Nulliparous	258	313	0.05
Multiparous	287	276	
Gestational age*			
24 - 27	117	121	0.90
28 - 33	134	121	
34 - 36	101	87	
37 - 41	236	215	
≥42	1	1	
Population birthweight chart ¹			
<5 th centile	129	145	0.96
AGA [§]	320	357	
INTERGROWTH-21 st			
Fetal			
<5 th centile	178	163	0.22
AGA [§]	320	345	

*completed weeks ¹ Dobbins et al 2012 [§] appropriate for gestational age (10th-90th centile)

Amongst the stillbirth cohort, the association between parity and fetal sex was significant (p=0.05), with a higher proportion of male stillbirths amongst nulliparous women (Table 2).

The association between SGA and fetal sex was not significant amongst the stillbirth cohort, with SGA defined by either the Dobbins population birthweight chart or Intergrowth-21st fetal growth centiles.

Conclusion

We performed a state-wide, retrospective cohort study of 398 419 births in Victoria, including 1134 stillbirths. The rate of stillbirth amongst this large, contemporary cohort was 2.8 per 1000 births.

We found no difference in the rate of stillbirth between female and male fetuses.

Our sub-analysis of stillbirths suggest that there is no association between small for gestational age and fetal sex.