

Gestational breast cancer: maternal and baby outcomes

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the degree of

Doctor of Philosophy

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Professor Andrew Hayen, Associate Professor Alex Wang,
and Doctor Antoinette Anazodo

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Certificate of original authorship

I, Nadom Hikmet Safi, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy in the Faculty of Health at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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Format of the thesis

This PhD thesis is in a compilation format. Each of four studies is reported in a thesis chapter. Chapter 4 (study 1) has been published in Plos One. Chapter 5 (study 2) and Chapter 6 (study 3) are currently being prepared for publication, and Chapter 7 (study 4) has been published in the British Journal of Cancer.

Statement of contributions to jointly authored works contained in the thesis

Chapter 4 has been submitted for publication in a peer-reviewed journal.

Chapters 5 and 6 are ready for submission, and Chapter 7 is published in a peer-reviewed journal. For each of these manuscripts, I have been responsible for deciding the research question, conducting the statistical analysis and drafting the manuscript.

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For Chapters 4 and 6, Professor Christobel Saunders reviewed the manuscripts and added her clinical expertise. Professor Kei Lui provided his clinical opinion on the interpretation of the data for Chapters 4 and 7. For Chapters 6 and 7, Professor Jan E. Dickinson reviewed the manuscripts and added her clinical expertise. Professor Michael Nicholl provided his clinical opinion on the interpretation of the data for Chapters 4 and 5.

I take responsibility for the accuracy of the results presented in these manuscripts.

Abbreviations

ACOG	American College of Obstetricians and Gynecologists
ACR	American College of Radiology
AIHW	Australian Institute of Health and Welfare
AMOSS	Australasian Maternity Outcome Surveillance System
AOR	Adjusted odds ratio
APDC	Admitted Patient Data Collection
BMI	Admitted Patient Data Collection
CHeReL	Centre for Health Record Linkage
CI	Confidence interval
CNB	Core needle biopsy
CS	Caesarean section
CT	Computerised tomography
HER 2	Human epidermal growth factor receptor 2
FNA	Fine needle biopsy
GBC	Gestational breast cancer
ESUR	The European Society of Urogenital Radiology
GC	Gestational cancer
ICU	Intensive care unit
LGA	Large for gestational age
mGy	Milligray
MRI	Magnetic resonance imaging

NICU	Neonatal intensive care unit
NSW	New South Wales
O/E	observed/ estimated
PABC	Pregnancy-associated breast cancer
PAC	Pregnancy-associated cancer
PDC	Perinatal Data Collection
PPH	Post-partum haemorrhage
RDS	Respiratory distress syndrome
SCN	Special care nursery
SGA	Small for gestational age
UTS	University of Technology Sydney
US	United States
WA	Western Australia

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Abstract

Background

The incidence of gestational breast cancer (GBC), also called breast cancer diagnosed during pregnancy, is rising. GBC presents unique challenges in clinical management to optimise outcomes for mothers and their babies.

Aim

To examine the perinatal outcomes of women with GBC to create an evidence-base to assist health care providers in clinical management. The main objectives were:

- to describe the incidence, management, and perinatal outcomes of women with GBC,
- to investigate factors affecting their survival,
- to explore the safety of options available to healthcare providers for diagnosing GBC, and
- to describe the outcomes of babies exposed to GBC systemic treatment.

Methods

Four studies were conducted using population-based data sets. Studies 1 and 2 utilised New South Wales (NSW) data to investigate all women with pregnancies that ended in live birth or stillbirth between 1 January 1994 and 31 December 2013. Studies 3 and 4 utilised data from the Australasian Maternity Outcome Surveillance System GBC study collected in Australia and New Zealand between 1 January 2013 and 30 June 2014.

Results

- Studies 1 and 2: The annual incidence of GBC in NSW was 6.8/100,000 women. Women with GBC were more likely to give birth by labour induction or pre-labour caesarean section (CS) than women with no cancer (adjusted odds ratio (AOR) 4.8, 95%CI: 2.96–7.79). Babies born to women with GBC were more likely to be preterm (AOR 12.93, 95%CI: 8.97–18.64) and low birthweight. Of 122 women identified with GBC, 19.7% died within five years of diagnosis. The mortality rate for women with stage 4 cancer at diagnosis was 1,446/10,000 person-years, which is higher than that for women with stages 2 and 3 (399/10,000 person-years) or stage 1 (222/10,000 person-years).
- Studies 3 and 4: 83% of women with GBC experienced a painless breast lump. Breast ultrasound was the first-line imaging modality in all women. Eighteen babies exposed to breast cancer systemic treatment during pregnancy were born. None had a congenital malformation or major neonatal morbidity .

Conclusion

There was a high rate of preterm birth among women with GBC. Most births followed induction of labour or pre-labour CS. The crude 5-year mortality observed for women with GBC was 19.7%, which is almost double that previously reported for all women diagnosed with breast cancer in Australia. GBC diagnosed during mid-pregnancy and treated with chemotherapy was associated with a high rate of planned preterm birth but no increase in perinatal mortality.