OBSTETRICS

# Association between parity and breastfeeding with maternal high blood pressure

Samantha J. Lupton, BMedRes; Christine L. Chiu, PhD; Sanja Lujic, MBiostat; Annemarie Hennessy, MBBS, PhD; Joanne M. Lind, PhD

**OBJECTIVE:** The objective of this study was to determine how parity and breastfeeding were associated with maternal high blood pressure, and how age modifies this association.

**STUDY DESIGN:** Baseline data for 74,785 women were sourced from the *45 and Up Study*, Australia. These women were 45 years of age or older, had an intact uterus, and had not been diagnosed with high blood pressure before pregnancy. Odds ratios (ORs) and 99% confidence intervals (CIs) for the association between giving birth, breastfeeding, lifetime breastfeeding duration, and average breastfeeding per child with high blood pressure were estimated using logistic regression.

**RESULTS:** The combination of parity and breastfeeding was associated with lower odds of having high blood pressure (adjusted OR, 0.89; 99% CI, 0.82–0.97; $P < .001$), compared with nulliparous women, whereas there was no significant difference between mothers who did not breastfeed and nulliparous women (adjusted OR, 1.06; 99% CI, 0.95–1.18; $P = .20$). Women who breastfed for longer than 6 months in their lifetime, or greater than 3 months per child, on average, had significantly lower odds of having high blood pressure when compared with parous women who never breastfed. The odds were lower with longer breastfeeding durations and were no longer significant in the majority of women over the age of 64 years.

**CONCLUSION:** Women should be encouraged to breastfeed for as long as possible and a woman's breastfeeding history should be taken into account when assessing her likelihood of high blood pressure in later life.

**Key words:** breastfeeding, cardiovascular disease, high blood pressure, parity, women

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Pregnancy and breastfeeding are associated with large changes to the female hormonal profile. A correlation between these events and a woman's risk of cardiovascular disease has been reported since the 1950s[1] with more recent large cohort studies showing breastfeeding is beneficial to maternal cardiovascular health.[2-5]

Cardiovascular diseases are the leading cause of death among women in developed countries. Hypertension is one of the most prevalent cardiovascular diseases and is a strong predictor of other cardiovascular diseases including atherosclerosis, myocardial infarction, and stroke. Age is a powerful predictor of hypertension, with increasing age associated with increasing rates of hypertension in industrialized countries.[6]

The association between pregnancy and hypertension in later life remains unclear. Early work within the field found an association between increasing number of pregnancies and lower odds of hypertension,[7] whereas other studies have shown no association between parity and blood pressure.[8,9] These studies had relatively small sample sizes in comparison to the large cohorts that have since been established.

Breastfeeding has been reported to confer many benefits upon the newborn, including reduced levels of childhood obesity,[10] hypertension,[11-13] and hyperlipidemia.[14,15] More recent studies have found an association between breastfeeding and a lower risk of maternal hypertension. This was first reported in 2005 by the Korean Women's Cohort (KWC) Study[2] and has since been reported by the Study of Women's Health Across the Nation (SWAN),[3] the Women's Health Initiative (WHI) Study,[4] and the US Nurses' Health Study II.[5] No studies have examined whether the combined effect of parity and breastfeeding is associated with high blood pressure, and how age modifies the association between breastfeeding and high blood pressure.

The present study aimed to determine: (a) the association between the event of giving birth with high blood pressure in later life, using observational data from the *45 and Up Study*, Australia, (b) whether the combination of giving birth and breastfeeding is associated with high blood pressure in later life, and (c) if the duration of breastfeeding was associated with high blood pressure in later life, and how this association is modified as women age.

## Materials and Methods

This study obtained data from women participating in the *45 and Up Study*, a

From the University of Western Sydney, School of Medicine, Campbelltown, NSW, Australia.

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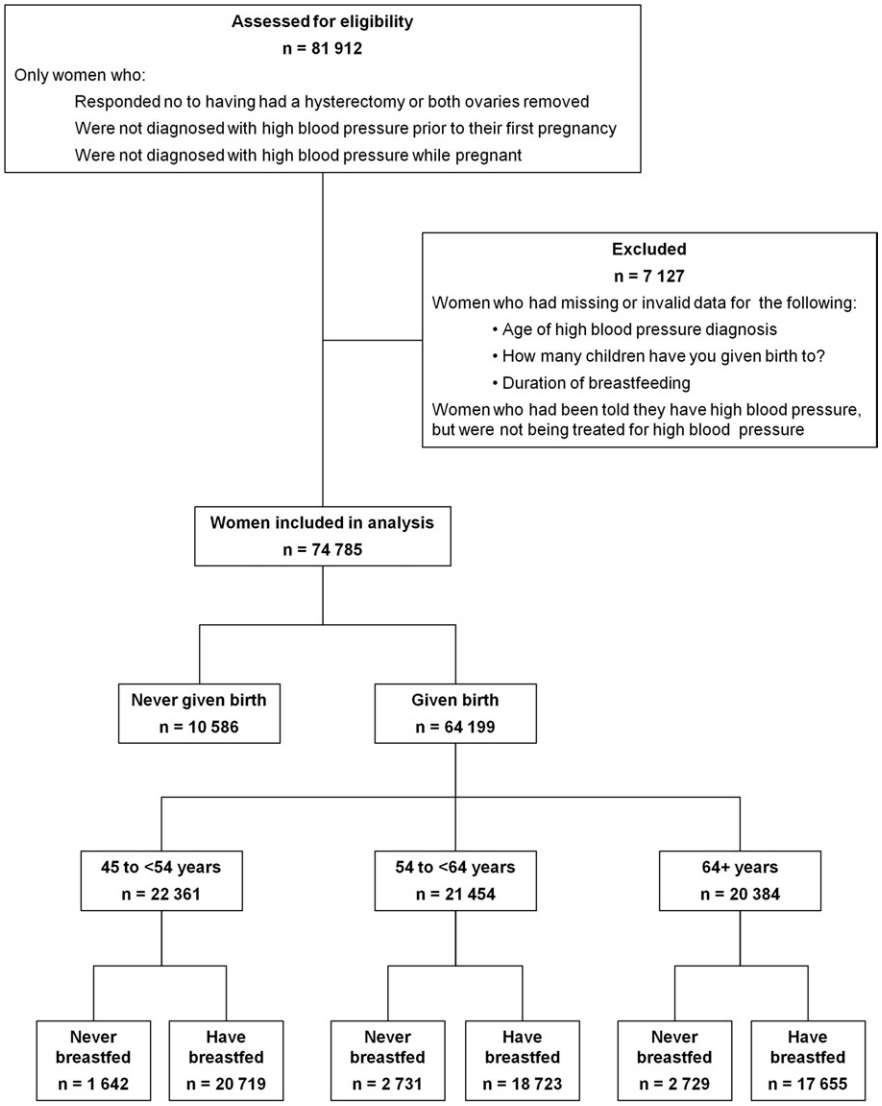
FIGURE 1
**Participants included in the study**




Flow chart of participant inclusion.

*Lupton. Parity, breastfeeding, and high blood pressure. Am J Obstet Gynecol 2013.*

large scale cohort study of 267,153 men and women aged 45 and over in New South Wales, Australia. Participants were randomly selected from the Australian Medicare Database, which provides near complete coverage of the population, and they were enrolled into the study by completing a baseline questionnaire (available at www.45andUp.org.au) and providing a signed consent form. People aged 80 years and over, and residents of rural and remote areas were oversampled. Study recruitment commenced in 2006 and was completed in 2009. The methods for the *45 and Up Study* have been described elsewhere.[16] The *45 and Up Study* received ethics approval from the University of NSW Human Ethics Committee, and the current study was approved by the University of Western Sydney Human Research Ethics Committee. Exposure-outcome relationships estimated from the *45 and Up Study* data have been shown to be consistent with another large study of the same population, regardless of the underlying response rate or mode of questionnaire administration.[17]

All of the data used in this study were acquired from the *45 and Up Study* baseline questionnaire. Women were included in this study if: they were age 45 years or more; had never given birth or had given birth after 18 years of age and before 45 years of age; had not had a hysterectomy or both ovaries removed; and had responded "No" to the question "Has a doctor ever told you that you have: high blood pressure–when pregnant?" (Figure 1).

Women were defined as having high blood pressure if they answered "Yes" to the question "In the last month have you been treated for: high blood pressure." Women were excluded if: they answered "Yes" to the question "Has a doctor ever told you that you have: high blood pressure – when not pregnant?" and the "Age when condition was first found" was younger than, the age reported on the question "How old were you when you gave birth to your FIRST child?"; answered "Yes" to "Has a doctor ever told you that you have: high blood pressure – when not pregnant?", but were not being treated for high blood pressure; they failed to provide an age of onset for high blood pressure; they provided invalid data for family history; or they provided invalid data for the number of children they had given birth to in their specified age range (Figure 1). Classification of demographic and lifestyle characteristics have been described elsewhere.[18]

Women were classified as never having given birth if they answered "0' to the question "How many children have you given birth to?", with the further instruction to "please include stillbirths but do not include miscarriages, please write '0' if you have not had any children." Total breastfeeding duration was obtained from the response to the question "For how many months, in total, have you breastfed?". Average breastfeeding duration was obtained by dividing the total breastfeeding duration by the reported number of children for each woman.

Odds ratios (ORs) and 99% confidence intervals (CIs) for the association between giving birth, breastfeeding, lifetime breastfeeding duration, and average breastfeeding per child with high blood pressure were estimated using logistic regression. For the analysis of whether giving birth is associated with having high blood pressure, women who had never