

# Redefining the relationship between blood pressure and pregnancy outcomes – retrospective cohort study

Katrina Harris<sup>1</sup>, Daniel Rolnik<sup>1</sup>, Wentao Li<sup>1</sup>, Ben Mol<sup>1</sup>, Fabricio Costa<sup>1</sup>, Euan Wallace<sup>1</sup>, Kirsten Palmer<sup>1</sup>, Maya Reddy<sup>1,2</sup>

<sup>1</sup> Department of Obstetrics and Gynaecology, Monash University

<sup>2</sup> Monash Womens, Monash Health

Email – Maya.Reddy@monash.edu



## Background

Hypertension in pregnancy is defined as a blood pressure greater than or equal to 140/90 mmHg on two occasions at least four hours apart. These thresholds have been derived from guidelines in non-pregnant individuals but have never been validated in pregnancy. The American College of Cardiology (ACC) now endorses lower thresholds for hypertension (Table 1). It is unclear whether these definitions should be applied to the pregnancy setting.

Normal BP	SBP < 120 AND DBP < 80 mmHg
Elevated BP	120 ≤ SBP < 130 AND DBP < 80 mmHg
Stage one HTN	130 ≤ SBP < 140 OR 80 ≤ DBP < 90 mmHg
Stage two HTN	SBP ≥ 140 OR DBP ≥ 90 mmHg

Table 1: Blood pressure categories as per ACC criteria.

HTN = hypertension, BP = Blood pressure, SBP = systolic BP, DBP = Diastolic BP

## Objectives

To examine the association between blood pressure and maternal and perinatal outcomes.

A) Assess the relationship between BP and outcomes using the new ACC criteria.

B) Assess the relationship between BP and outcomes as a continuum.

## Methods

1) Data were extracted from all singleton pregnancies at Monash Health, Australia between 2016-2018.

2) Data obtained included maternal characteristics, pregnancy outcomes, and BP measurements at < 20 weeks, 20-24 weeks, 28-32 weeks and 34-36 weeks.

3) BP measurements were then recategorized according to the ACC criteria and as mean arterial pressure (MAP).

4) Outcomes of interest included preeclampsia (PE), preterm birth, and a composite of perinatal outcomes (birthweight < 3<sup>rd</sup> centile, stillbirth, neonatal death, admission to neonatal intensive care for ≥ 48 hours).

5) The relationship between BP and pregnancy outcomes was then analysed using logistic regression analysis.

## Results

We included 18,243 singleton pregnancies in this study. Overall, the mean age of participants was 30.8 years, the median BMI was 25.0 kg/m<sup>2</sup>, the median gestation of delivery was 39.3 weeks and the mean birthweight was 3314 grams. The incidence of preeclampsia was 3.3%, the incidence of preterm birth was 7.1% and the rate of birthweight less than 3<sup>rd</sup> centile was 2.1%. There were 128 perinatal deaths (0.7%) and 297 neonatal intensive care admissions (1.6%).

1A. Preeclampsia – Mean arterial pressure

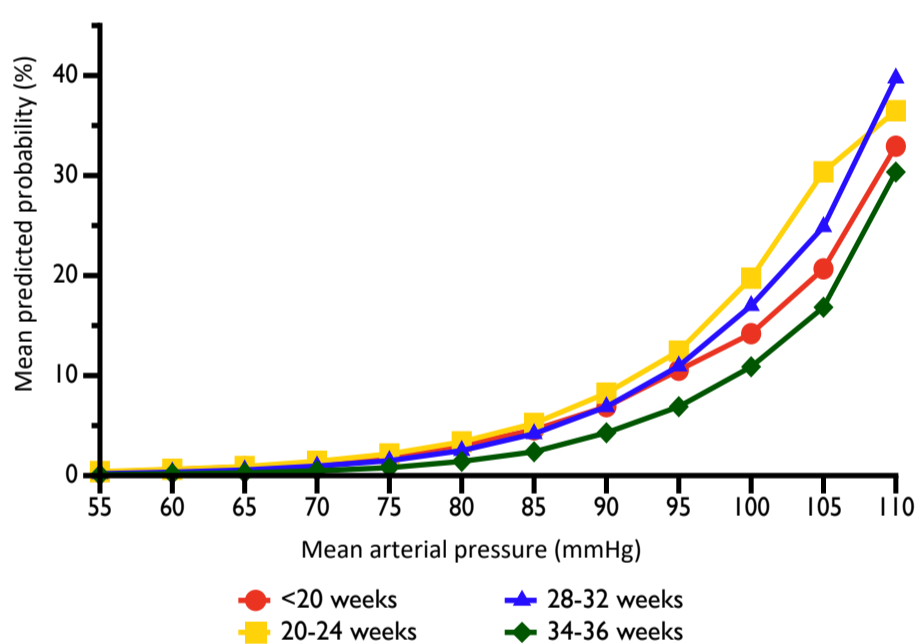


Figure 1A: The probability of developing preeclampsia increases with each incremental rise in MAP and this is predominately after a MAP of 90 mmHg.

2A. Preterm Birth – Mean arterial pressure

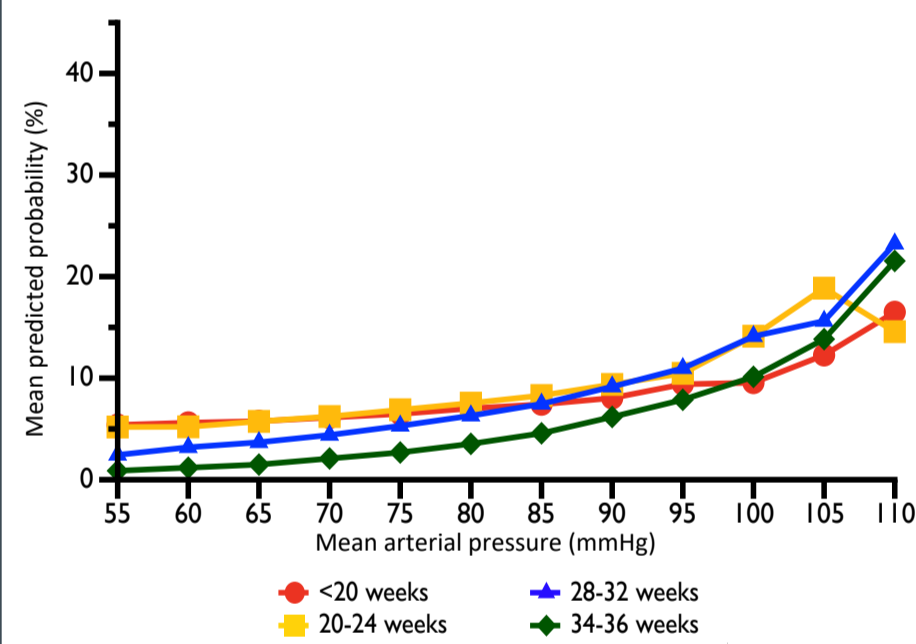


Figure 2A: The probability of preterm birth increases with each incremental rise in MAP. This trend is less prominent than the trend identified for PE.

3A. Composite perinatal outcome – Mean arterial pressure

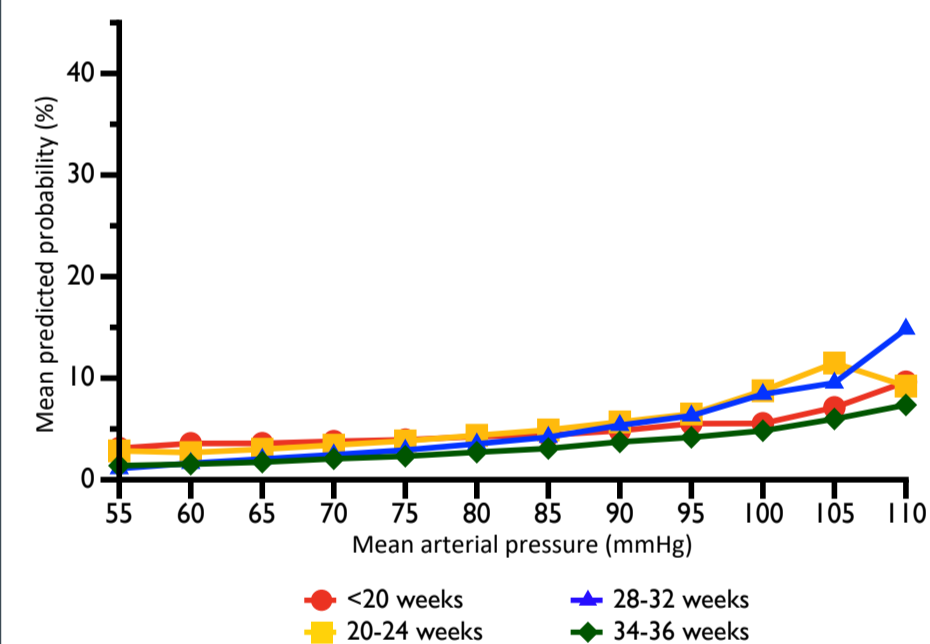


Figure 3A: The probability of an adverse perinatal outcome increases with each incremental rise in MAP. This trend is less prominent than the trend identified for PE.

1B. Preeclampsia – ACC criteria

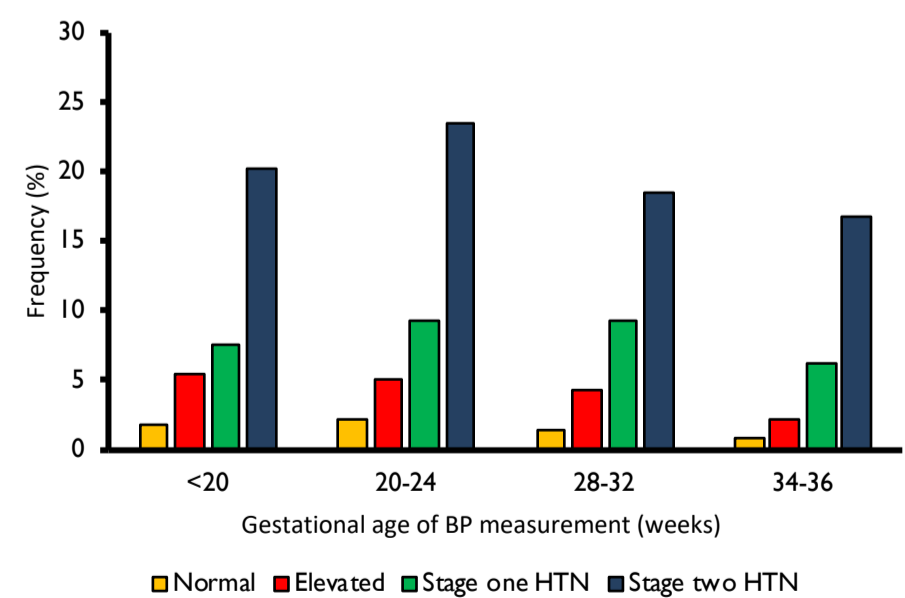


Figure 1B: Increase in blood pressure category is associated with an increased incidence of preeclampsia. In particular 6-9% of women with “stage one HTN” will develop PE in comparison to 1-2% of those with “normal” BP.

2B: Preterm Birth – ACC criteria

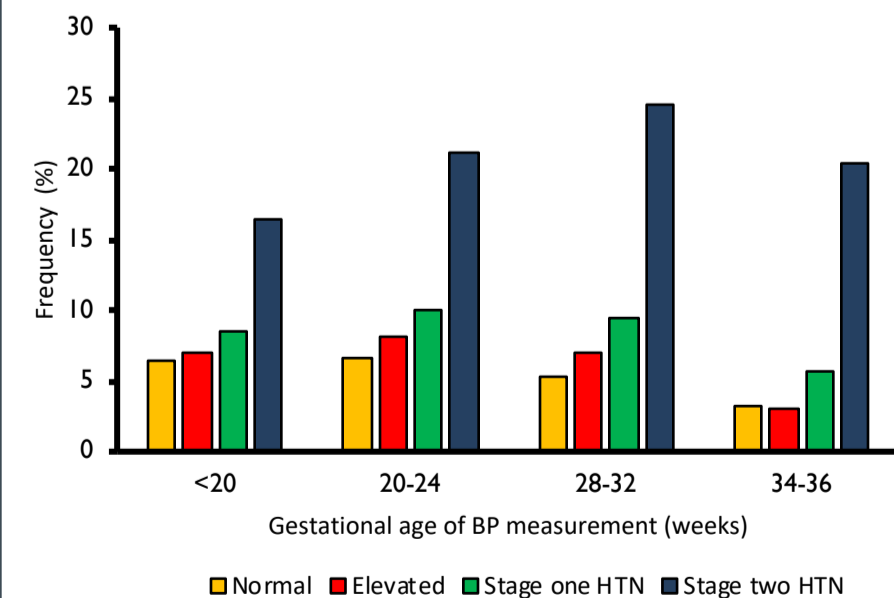


Figure 2B: Increase in blood pressure category is associated with an increased incidence of preterm birth. In particular rates of preterm birth are higher in those with “stage one HTN” and “stage two HTN”.

3B. Composite Perinatal – ACC criteria

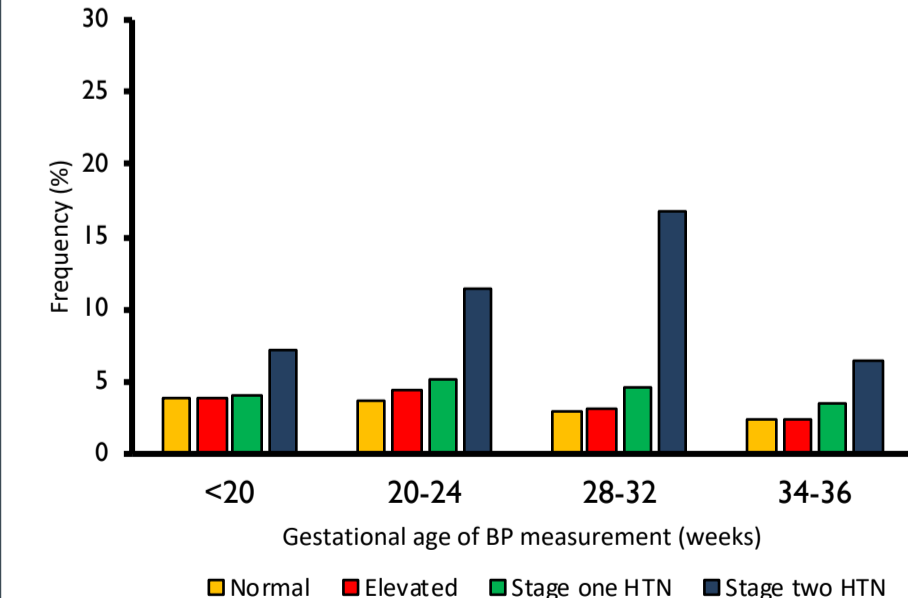


Figure 3B: Increase in blood pressure category is associated with an increased incidence of adverse perinatal outcomes. In particular women with stage 2 HTN have higher rates of adverse perinatal outcomes in comparison to the other categories.

## Conclusion

Across all gestational ages, MAP and blood pressure category according to the ACC criteria are independently associated with preeclampsia, and to a lesser extent preterm birth and adverse perinatal outcomes. These associations are not exclusive to women with a blood pressure greater than 140/90 mmHg. Consideration of lower blood pressure thresholds may identify more women at risk of preeclampsia and adverse events in pregnancy.