

RECENT STUDIES IN HYPERTENSION

The POP-HT trial

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The Physician Optimised Postpartum Hypertension Trial was presented as a Late Breaking Clinical Trial at the American Heart Association Meeting in Philadelphia in November 2023. The primary blood pressure outcome was reported simultaneously in JAMA¹ alongside the secondary imaging results in Circulation.²

The study tested the novel hypothesis that blood pressure control in the immediate post-partum period, while the cardiovascular system recovers from a hypertensive pregnancy, could have long term benefits for cardiovascular health. The study showed controlling blood pressure for, on average, around 40 days post-partum is associated with a 5 to 7 mmHg lower blood pressure nine months later. The intervention also significantly reduced the number of hospital readmissions and associated with significant improvements in cardiovascular structure and function.

What was the inspiration behind the study?

We had previously undertaken observational studies suggesting there was a strong link between blood pressure levels measured at six weeks postpartum and patterns of blood pressure and cardiac structure five to ten years later.^{3,4} This could have been because women predisposed to high blood pressure just tend to have high blood pressure at any point in life. However, we also noticed that the pattern of cardiac changes we saw five to ten years later were out of proportion to the levels of blood pressure at that time point.³

We know blood pressure can be difficult to control for several weeks after pregnancy and it is during this time, also known as the puerperium, that the heart has to recover from the hypertensive pregnancy. The heart extensively remodels in

response to the demands of pregnancy and this remodelling needs to reverse after pregnancy. Based on these observations, we came up with the completely novel hypothesis that poor blood pressure control during the puerperium could be leading to a persistence of damage to the cardiovascular system. This could be affecting the longer term cardiovascular health of women who have a hypertensive pregnancy.

The only way to properly test this hypothesis, to convince people that we might be on to something, was to undertake a randomised controlled trial to modify blood pressure levels during the weeks after pregnancy. First, we teamed up with leading experts in the field of blood pressure self-management, both in adult life and during pregnancy, and undertook a feasibility study to make sure it was going to be possible to deliver a blood pressure intervention during the puerperium.⁵ This was known as the SNAP-HT study and enabled the development and testing of a bespoke app so that women could upload their blood pressure readings and receive instructions about how to change their medication.

The study showed women were very happy to self-manage their blood pressure during this period but, although a small scale study, we picked up some additional, very exciting signals in the results. When we checked the blood pressures of the women in the months and years after pregnancy, those who had received the self-monitoring continued to have significantly lower blood pressure, even though most of them had stopped taking medication several weeks, months or years before. Four years later, the group who had personalised blood pressure control for the four to six weeks after pregnancy continued to have lower blood pressure.⁵

How did you design the POP-HT study and what were the key outcomes?

The initial results from SNAP-HT prompted us to plan a full scale study designed purposefully to test whether an intervention in the 4 to 6 weeks after pregnancy would lower blood pressure long term.⁶ In POP-HT, for the intervention arm, the study clinicians, who were obstetricians and cardiologists, remotely managed blood pressure. Their advice was based on the blood pressure data being supplied by the mother through their app.

Participants were randomly allocated, while still in hospital after their hypertensive pregnancy either to self-manage their blood pressure using this app or enter the control arm. In the control arm the mothers received standard NHS-led care. This typically involves a review by a primary care practitioner or midwife at day seven to 10 and a review by their primary care practitioner at 6-8 weeks. Although the clinicians providing advice and the mothers knew which group they were in, to ensure the results were not biased, all the outcome data such as the blood pressure readings were collected and analysed automatically. Furthermore, all the imaging data was analysed separately without any information on whether the participant had received the intervention.

In total, we recruited over 200 women into the study, which we knew would be an appropriate size of study to pick up differences in blood pressure of around 5mmHg between each group, six to nine months after pregnancy. Indeed, at the end of the study, what we saw was that those who receive remote self-management during the first few weeks after pregnancy have a ~7 mmHg lower systolic and ~6 mmHg lower diastolic blood pressure in both ambulatory and clinic readings six to nine months after pregnancy. What is more, they have less heart wall thickening, smaller cardiac chamber sizes and better heart function.

What comes next?

The results suggest we need to completely rethink the biological significance of the post-partum period and how we deliver post-partum care in women who have had a hypertensive pregnancy. If we get this right, we could change the cardiovascular health trajectory of a huge cohort

of women. However, POP-HT was a single centre study using one type of intervention. Therefore, we urgently need to work out the optimal way to deliver an intervention to all women, across all types of healthcare and ensure similar effects are seen in different countries. There are also opportunities to dig deeper into the mechanisms behind this phenomenon and understand whether different types of interventions and medications may have similar benefits.

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