

Cardiovascular Sequels of Hypertension in Pregnancy

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Hypertensive disorders in pregnancy are the most common medical complications of pregnancy, affecting 5% to 10% of pregnancies. It has been long believed that all the problems of gestational hypertension get solved within 6 weeks postpartum. However, gestational hypertension, and preeclampsia in particular, has been found to be associated with an increased risk of developing hypertension, stroke, coronary heart disease, and venous thromboembolism in later life.¹ A recent systematic review and meta-analysis² of 22 studies including >258 000 women with preeclampsia found preeclampsia to be associated with a 4-fold increase in incident heart failure and a 2-fold increased risk in coronary heart disease, stroke, and cardiovascular death.

Preexisting hypertension is associated with an increased risk of developing preeclampsia, which may complicate ≈25% of cases. There is now convincing evidence that this risk can be substantially reduced by using low-dose acetylsalicylic acid (100–150 mg, aspirin). The new crucial point is that low-dose aspirin should be initiated from week 12 and continued to weeks 36 to 37.³

In this issue of the *Journal of the American Heart Association (JAHA)*, there are 2 articles addressing late cardiovascular complications of hypertensive pregnancies.^{4,5}

A nested-case control study of 7566 women who had live birth or stillbirth delivery in Olmsted County, Minnesota, between 1976 and 1982 found that women experiencing hypertensive pregnancy disorders had a greater chance of

developing atrial fibrillation compared with normotensive controls.⁴ This relationship could have been, at least partially, mediated by associated obesity and hypertension. Atrial fibrillation was diagnosed 31±8 years after the first pregnancy in cases and 30±8 years after the first pregnancy in controls.

It is the first study directly evaluating the relationship between hypertensive pregnancy disorders and atrial fibrillation. The advantage of this study is that cases and controls come from the same population, Olmsted County.

On the other hand, there are also some study limitations, such as its retrospective design and no standardization of blood pressure (BP) measurement. However, the Olmsted County population is almost 100% white and all women included in the study had at least high school level education. This population is definitely not representative of the United States. All hypertensive disorders in pregnancy, and preeclampsia in particular, are more common in blacks.

The article by Riise et al⁵ used data from the Medical Birth Registry of Norway collecting compulsory notification of live births and stillbirths since 1997 on all pregnancies beyond 16 weeks of gestation, including maternal characteristics as well as pregnancy complications. The analysis included all women with their first delivery from 1980 to 2009 (a total of 617 589); the median follow-up was 14.3 years. For this purpose, the Medical Birth Registry of Norway was linked to the Cardiovascular Disease in Norway project, with the Norwegian Cause of Death Registry, Statistics Norway, and the National Population Registry, to obtain the cause and date of death and sociodemographic status. Women with gestational hypertension in their first pregnancy had a 1.8-fold (95% confidence interval, 1.7–2.0-fold) higher risk of subsequent cardiovascular disease (CVD) compared with women without any hypertensive pregnancy disorders, and the risk was further increased with small-for-gestational age babies and/or preterm delivery. The risk for subsequent CVD was similar for preeclampsia and gestational hypertension when complicating only the first pregnancy, whereas if preeclampsia occurred in a subsequent pregnancy, it was associated with a higher risk of CVD than gestational hypertension. Thus, gestational hypertension should be considered, in addition to preeclampsia, when assessing a woman's risk of CVD. The results of

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Riise et al⁵ also suggest that gestational hypertension and preeclampsia should be analyzed separately in future studies.

Similar to the case-control study from Olmsted County, there is no standardization of BP measurement. Moreover, the Medical Birth Registry of Norway uses a different definition of gestational hypertension (ie, hypertension occurring after 20 weeks of gestation defined as systolic BP \geq 140 mm Hg and/or diastolic BP \geq 90 mm Hg or an increase $>$ 15 mm Hg from BP measured before gestational week 20).

Despite the limitations of and differences between both studies, they convincingly show the increased risk of late CVD after hypertensive pregnancies. More important, both studies show the significance of gestational hypertension, whereas previous studies suggested the risk was particularly increased in preeclampsia.

Thus, both studies clearly highlight the need for establishing regular follow-up of women with hypertensive pregnancy disorders.⁶

The 2011 American Heart Association updated guidelines for the prevention of CVD in women⁷ stated that pregnancy provides a unique opportunity to estimate a woman's lifetime risk. It was also suggested that preeclampsia may be an early indicator of CVD risk.

The risk of preeclampsia and pregnancy-induced hypertension was not recognized in Europe until the publication of the 2016 European Guidelines on CVD prevention in clinical practice,⁸ suggesting consideration of periodic screening for hypertension and diabetes mellitus (IIa class of recommendation, B level of evidence). In women with a history of premature birth, the recommendation is that periodic screening for hypertension and diabetes mellitus may be considered (IIb class of recommendation, B level of evidence).

Despite the agreement of both guidelines^{7,8} that pregnancy may represent a unique stress test to identify women with a future risk of developing CVD, no systematic follow-up has been established to date. Women with hypertension in pregnancy are rarely told about their future risk of subsequent CVD, including hypertension; they are reluctant to come for a checkup, pretending they are fully occupied by care of their infants.

In conclusion, pregnancy offers a unique window for identification of women at risk of future CVD. Efforts should

be made to establish specialized clinics to monitor women postpartum to reduce the burden of future CVD.⁹

Disclosures

None.

References

- Bellamy L, Casas JP, Hingorani AD, Williams DJ. Pre-eclampsia and risk of cardiovascular disease and cancer in later life: systematic review and meta-analysis. *BMJ*. 2007;335:974. Epub November 1, 2007.
- Wu P, Hatthothuwa R, Kwok CS, Babu A, Kotronias RA, Rushton C, Zaman A, Fryer AA, Kadam U, Chew-Graham CA, Mamas MA. Preeclampsia and future cardiovascular health: a systematic review and meta-analysis. *Circ Cardiovasc Qual Outcomes*. 2017;10:e003497. Epub February 22, 2017.
- Rolnik DL, Wright D, Poon LC, O'Gorman N, Syngelaki A, de Paco Matallana C, Akolekar R, Cicero S, Janga D, Singh M, Molina FS, Persico N, Jani JC, Plasencia W, Papaioannou G, Tenenbaum-Gavish K, Meiri H, Gizurason S, MacLagan K, Nicolaides KH. Aspirin versus placebo in pregnancies at high risk for preterm preeclampsia. *N Engl J Med*. 2017;377:613–622.
- Scantlebury D, Kattah A, Weissgerber T, Agarwal S, Mielke M, Weaver A, Vaughan L, Henkin S, Zimmerman K, Miller V, Hayes S, Garovic V. The impact of a history of hypertension in pregnancy on later diagnosis of atrial fibrillation. *J Am Heart Assoc*. 2018;7:e007584. DOI: 10.1161/JAHA.117.007584.
- Riise HKR, Sulo G, Tell GS, Igland J, Nygård O, Iversen A-C, Daltveit AK. The association between gestational hypertension and risk of cardiovascular disease among 617,589 Norwegian women. *J Am Heart Assoc*. 2018;7:e008337. DOI: 10.1161/JAHA.117.008337.
- Cusimano MC, Pudwell J, Roddy M, Cho CK, Smith GN. The maternal health clinic: an initiative for cardiovascular risk identification in women with pregnancy-related complications. *Am J Obstet Gynecol*. 2014;210:438.e1–9.
- Mosca L, Benjamin EJ, Berra K, Bezanson JL, Dolor RJ, Lloyd-Jones DM, Newby LK, Piña IL, Roger VL, Shaw LJ, Zhao D, Beckie TM, Bushnell C, D'Armiento J, Kris-Etherton PM, Fang J, Ganiats TG, Gomes AS, Gracia CR, Haan CK, Jackson EA, Judelson DR, Kelepouris E, Lavie CJ, Moore A, Nussmeier NA, Ofili E, Oparil S, Ouyang P, Pinn VW, Sherif K, Smith SC Jr, Sopko G, Chandra-Strobo N, Urbina EM, Vaccarino V, Wenger NK. Effectiveness-based guidelines for the prevention of cardiovascular disease in women—2011 update: a guideline from the American Heart Association. *Circulation*. 2011;123:1243–1262.
- Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, Cooney MT, Corrà U, Cosyns B, Deaton C, Graham I, Hall MS, Hobbs FDR, Løchen ML, Löllgen H, Marques-Vidal P, Perk J, Prescott E, Redon J, Richter DJ, Sattar N, Smulders Y, Tiberi M, van der Worp HB, van Dis I, Verschuren WMM, Binno S; ESC Scientific Document Group. 2016 European guidelines on cardiovascular disease prevention in clinical practice: the Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts). Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). *Eur Heart J*. 2016;37:2315–2381.
- Lind JM, Hennessy A, McLean M. Cardiovascular disease in women: the significance of hypertension and gestational diabetes during pregnancy. *Curr Opin Cardiol*. 2014;29:447–453.

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