**Pregnancy Related Cardiovascular Risk Factors**

*Q1. Consider the average female who sees you postpartum. Her pregnancy was complicated by preeclampsia. Apart from the usual postpartum checks, is there anything further you would do?*

She should have her blood pressure checked as a minimum. She should also be counselled that preeclampsia increases her risk of future cardiovascular disease; and to have regular follow up of her cardiovascular risk factors.

*Q2. What problems in pregnancy increase a woman’s cardiovascular risk?*

A history of pregnancy induced hypertension including preeclampsia; gestational diabetes; preterm delivery (<37 weeks); low birth weight delivery (<2500g); placental syndromes; stillbirth/miscarriage; have all been associated with increased cardiovascular risk in the future.

**Preeclampsia** = new onset hypertension (>140/90) and proteinuria >0.3g/24hours after 20 week gestation. It affects about 3-5% of pregnancies. It is a multisystem disorder that may involve renal, haematological, hepatic and/or neurological dysfunction. Preeclampsia is most common in the 1st pregnancy and abates with delivery of the placenta. However despite this, it still imparts a long-lasting cardiovascular risk.

A meta-analysis found that after Preeclampsia the relative risk for maternal hypertension is 3.70, for Ischaemic Heart disease (IHD) - 2.16, for stroke - 1.81 and for venous thromboembolism - 1.79. [[1]](#footnote-1) Further data, based on systemic reviews/meta-analyses identify that women with preeclampsia/eclampsia have an odds ratio (OR) of cardiovascular disease (CVD) of 2.28, OR of cerebrovascular disease of 1.76 and a relative risk for the development of hypertension of 3.13. [[2]](#footnote-2)

Preeclampsia is also associated with increased risk of hospitalisation and death from IHD [[3]](#footnote-3)and Myocardial infarction (MI) [[4]](#footnote-4), increased coronary artery calcium score[[5]](#footnote-5), increased prevalence of cardiovascular risk factors and developing metabolic syndrome (especially early preeclampsia) [[6]](#footnote-6), increased LDL and TG[[7]](#footnote-7), exaggerated insulin resistance[[8]](#footnote-8), increased risk of developing diabetes (almost 2 fold)[[9]](#footnote-9), and increased blood pressure and risk of stroke in the child.[[10]](#footnote-10)

**Gestational Hypertension =** normotensive <20week gestation, but hypertension >20 week with no proteinuria. De novo gestational hypertension is associated with increased risk of subsequent hypertension, CVD (including fatal MI), cerebrovascular disease, kidney disease and diabetes; in absence of other risk factors[[11]](#footnote-11). Increased levels of glucose, insulin, triglycerides, total cholesterol, LDL, and microalbumin are also found after a pregnancy with hypertensive disorders and decreased HDL. [[12]](#footnote-12)

**Gestational Diabetes** (GDM)– women with a history of gestational diabetes have a 70% higher risk of CVD. This risk is mainly due to Type II diabetes (T2DM) but may also stem from abnormal vascular function associated with gestational diabetes. Progression to T2DM on a background of previous GDM is a very strong risk factor, with a 4 fold cardiovascular risk elevation. [[13]](#footnote-13) GDM progresses to T2DM in 2.6-70% of cases after 6 weeks to 28 years postpartum and is associated with metabolic disturbances and CVD in mothers and their offspring. [[14]](#footnote-14) Women with GDM also have a higher risk for preeclampsia and gestational hypertension, both of which as described above, are associated with CVD and hypertension in later life. [[15]](#footnote-15)

**Maternal placental syndromes** such as preeclampsia, gestational hypertension, placental abruption or placental infarction increases risk of developing cardiovascular disease (Hazard ratio =2). The risk is even higher if combined with poor fetal growth or fetal death [[16]](#footnote-16)

**Preterm birth (<36 week) and low birthweight** – are associated with reduced survival from IHD. Women with babies <2500g vs >3500g had 11x greater risk of death from IHD. [[17]](#footnote-17) The risks are additive - preeclampsia and low birth weight and preterm delivery risk of IHD or death is 7x greater than controls.

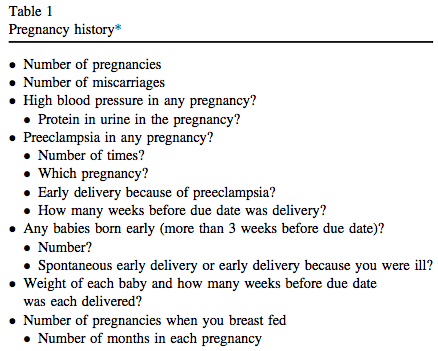
**Miscarriage and still birth** – women with >/= 1 stillbirth vs no still birth have an incident rate ratio (IRR) of 2.69 for MI, 1.74 for stroke, 2.42 for renovascular hypertension. [[18]](#footnote-18) Women with >/= 1 miscarriage vs no miscarriage have an IRR of 1.13 for MI, 1.16 for cerebral infarction, 1.2 for renovascular hypertension. Rates for all 3 outcomes increase with the number of miscarriages.

*There is compelling evidence that a history of pre-eclampsia/eclampsia; any hypertension in pregnancy, placental abruption; low birth weight; preterm delivery; gestational diabetes, stillbirth/miscarriage, SIGNIFICANTLY increase a woman’s risk of subsequent cardiovascular disease.*

Thus a **pregnancy history** is an integral component of cardiovascular risk evaluation for women.

*Q3. Do you incorporate a pregnancy history when assessing a woman’s cardiovascular risk?*

Suggested questions are summarised in Table 1. Adapted from Roberts and Hubel [[19]](#footnote-19)



**Management of Women with a history of pregnancy complications**

It is important to identify those at risk and incorporate a pregnancy history when evaluating a woman’s cardiovascular risk. These women should be counselled on their increased cardiovascular risk, advised on risk reduction and have regular follow up of their risk factors.

Early Lifestyle modification should be advised including maintaining normal body weight/reducing weight if overweight, having a healthy diet and doing regular exercise. Blood pressure, lipids and glucose should be checked regularly, and should be treated according to guidelines.

Patients with a history of gestational diabetes may benefit from **Metformin** – which reduces the incidence of diabetes by 50%[[20]](#footnote-20). **Pioglitazone** also reduces the risk of progression to T2DM by 72%[[21]](#footnote-21).

**Breastfeeding** should be encouraged. Breastfeeding more than 3 months is associated with a lower risk of T2DM. Breastfeeding >12months decreased (by 72%) the occurrence of cardiovascular disease, decreased the occurrence of hypertension, diabetes, and hyperlipidaemia. The longer the lactation, the lower the cardiovascular risk.[[22]](#footnote-22)

**Learning points**:

* Pregnancy related complications increase a woman’s subsequent cardiovascular risk – these include preeclampsia, gestational hypertension, gestational diabetes, placental syndromes, preterm delivery and low birth weight; miscarriage and still birth.
* Incorporating a pregnancy history is important in assessing a woman’s cardiovascular risk.
* This allows early intervention to reduce their subsequent cardiovascular risk.

1. Bellamy L, Casas J-P, Hingorani AD, Williams DJ. Preeclampsia and risk of cardiovascular disease and cancer in later life: a systemic review and meta-analysis. BMJ 2007; 335:974-977. [↑](#footnote-ref-1)
2. Brown MC, Best KE, Pearce MS, Waugh J, Robson SC, Bell R. Cardiovascular disease risk in women with pre-eclampsia: systemic review and meta-analysis. Eur J Epidemiol 2013, 28:1-19. [↑](#footnote-ref-2)
3. Hannaford P, Ferry S, Hirsch S. Cardiovascular sequelae of toxaemia of pregnancy. Heart 1997; 77: 154-8 [↑](#footnote-ref-3)
4. Smith GC. Pell JP, Walsh D. Pregnancy complications and maternal risk of ischaemic heart disease: a retrospective cohort study of 129 290 births. Lancet 2001: 357: 2002-6 [↑](#footnote-ref-4)
5. Cassidy-Bushrow AE, Bielak lF, Rule AD, et al. Hypertension during pregnancy is associated with coronary artery calcium independent of renal function. J Womens Health 2009; 18:1709-16. [↑](#footnote-ref-5)
6. Stekkinger E, Zandstra M, Peeters LL, Spaanderman ME. Early onset preeclampsia and the prevalence of postpartum metabolic syndrome. Obstet Gynacol 2009; 114: 1076-84. [↑](#footnote-ref-6)
7. Hubel CA, Lyall F, Weissfeld L, Gandley RE, Roberts JM. Small low density lipoproteins and vascular cell adhesion molecule-1 are increased in association with hyperlipidaemia in preeclampsia. Metabolism 1998; 47:1281-8 [↑](#footnote-ref-7)
8. Carr DB, Newton KM, Utzschneider KM, et al. Preeclampsia and risk of developing subsequent diabetes. Hypertens Pregnancy 2009; 28: 435-47. [↑](#footnote-ref-8)
9. Callaway LK, Lawlor DA, O’Callaghan M, Williams GM, Najman JM, McIntyre HD. Diabetes Mellitus in the 21 years after a pregnancy that was complicated by hypertension: findings from a prospective cohort study. Am J Obstet Gynaecol 2007; 197: 492. E1-7 [↑](#footnote-ref-9)
10. Kajantie E, Eriksson JG, Osmond C, Thornburg K, Barker DJ. Preeclampsia is associated with increased risk of stroke in the adult offspring: the Helsinki birth cohort study. Stroke 2009; 40:1176-80 [↑](#footnote-ref-10)
11. Mannisto J, Mendola P, Vaarasmaki M et al. Elevated blood pressure in pregnancy and subsequent chronic disease risk. Circulation 2013; 127:681-690. [↑](#footnote-ref-11)
12. Hermes W, Ket JCF, van Pampus MG, et al. Biochemical cardioavascular risk factors after hypertensive pregnancy disorders: a systemic review and meta-analysis. Obstet Gynecol Surv 2012; 67: 793-809. [↑](#footnote-ref-12)
13. Sullivan SD, Umans JG, Ratner R. Gestational diabetes: implications for cardiovascular health. Curr. Diab. Rep 12(1). 43-52 (2012) [↑](#footnote-ref-13)
14. Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of Type 2 diabetes: a systemic review. Diabetes Care 25 (10), 1862-1868 (2002). [↑](#footnote-ref-14)
15. Shand AW, Bell JC, McElduff A, Morris J, Roberts CL. Outcomes of pregnancies in women with pregestational diabetes mellitus and gestational diabetes mellitus: a population-based study in New South Wales, Australia. 1998-2002. Diabet. Med. 25 (6), 708-715 (2008). [↑](#footnote-ref-15)
16. Ray JG. Vermeulen MJ. Schull MJ, Redelmeier DA. Cardiovascular health after maternal placental syndromes (CHAMPS): population based retrospective cohort study. Lancet 2005; 366: 1797-803 [↑](#footnote-ref-16)
17. Smith GCS, Pell JP, Walsh D. Pregnancy complications and maternal risk of ischaemic heart disease: a retrospective cohort study of 129290 births. Lancet 2001; 357:2002-2006. [↑](#footnote-ref-17)
18. Ranthe MF, Andersen EA, Wholfahrt J, Bundgaard H, Melbye M, Boyd HA. Circulation 2013 Apr 30; 127 (17): 1775-82. [↑](#footnote-ref-18)
19. Roberts JM, Hubel CA. Pregnancy: a screening test for later life cardiovascular disease. Women’s Health Issues. 2010; 20:304-307. [↑](#footnote-ref-19)
20. Ratner RE, Christophi CA, Metzger BE et al. Prevention of diabetes in women with a history of gestational diabetes: effects of metformin and lifestyle interventions. J. Clin. Endocrinol. Metabl 93 (12). 4774-4779 (2008) [↑](#footnote-ref-20)
21. DeFronzo RA, Tripathy D, Schwenke DC et al. Pioglitazone for diabetes prevention in impaired glucose tolerance. N. Engl. J. Med. 364 (12). 1104-1115 (2011) [↑](#footnote-ref-21)
22. Schwartz EB, Ray RM, Stuebe AM, Allison MA, Ness RB, Freiberg MS, Cauley JA. Duration of lactation and risk factors for maternal cardiovascular disease. Obset Gynecol 2009; 113: 974-982. [↑](#footnote-ref-22)