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Original Article

Cost-effectiveness analysis of cardiovascular risk factor screening in women who experienced hypertensive pregnancy disorders at term

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ABSTRACT

Objectives: To assess the cost-effectiveness of post-partum screening on cardiovascular risk factors and subsequent treatment in women with a history of gestational hypertension or pre-eclampsia at term.

Study design: Two separate Markov models evaluated the cost-effectiveness analysis of hypertension (HT) screening and screening on metabolic syndrome (MetS), respectively, as compared to current practice in women with a history of term hypertensive pregnancy disorders. Analyses were performed from the Dutch health care perspective, using a life-time horizon. One-way sensitivity analyses and Monte Carlo simulation evaluated the robustness of the results.

Results: Both screening on HT and MetS in women with a history of gestational hypertension or pre-eclampsia resulted in increase in life expectancy (HT screening 0.23 year (95% CI −0.06 to 0.54); MetS screening 0.14 years (95% CI −0.16 to 0.45)). The gain in QALYs was limited, with HT screening and MetS screening generating 0.04 QALYs (95% CI −0.12 to 0.20) and 0.03 QALYs (95% CI −0.14 to 0.19), resulting in costs to gain one QALY of €4228 and €28,148, respectively. Analyses for uncertainty showed a chance of 74% and

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75%, respectively, that post-partum screening is cost-effective at a threshold of €60,000/QALY.

Conclusions: According to the available knowledge post-partum screening on cardiovascular risk factors and subsequent treatment in women with a history of gestational hypertension or pre-eclampsia at term is likely to be cost-effective.

Introduction

Hypertensive disorders are common complications of pregnancy, which complicates 6–8% of all pregnancies [1,2]. Accumulating evidence suggests that women experiencing hypertensive pregnancy disorders are at increased risk of cardiovascular disease later in life [3]. It has been suggested that pregnancy acts as a "natural stress test" and pregnancy offers an opportunity to identify women who are at high risk of cardiovascular disease later in life [4].

Several studies have assessed cardiovascular risk factors after pregnancy in women who experienced hypertensive pregnancy disorders [5,6]. Women with a history of hypertensive pregnancy disorders appear to exhibit more cardiovascular risk factors compared to women with a history of normotensive pregnancies [6]. Cardiovascular disease in women may be reduced by early detection of the presence of cardiovascular risk factors after their complicated pregnancy and subsequent lifestyle interventions, and by having a blood pressure, glucose or blood cholesterol check if indicated.

The American Heart Association guidelines (2011) recommend for cardiovascular risk screening in women to assess obstetric history in all asymptomatic women and consider pre-eclampsia as risk factor for later life maternal cardiovascular disease [7]. However, these guidelines still lack detailed advice and recommendations for subsequent screening with preventive treatments for cardiovascular disease (CVD), as, at present, evidence on costs and cost-effectiveness of cardiovascular screening and intervention programs in women who suffered from hypertensive pregnancy disorders is lacking.

The Hypertension Risk Assessment Study (HyRAS) aimed to identify cardiovascular risk factors post-partum and subsequently estimate individual cardiovascular event risks in women with a history of term gestational hypertension or term pre-eclampsia. The present study reports a model based economic evaluation performed alongside the HyRAS study [8].

Methods

HyRAS study

Full details of the Hypertension Risk Assessment Study (HyRAS study) have been reported previously [8,9]. In short, two-and-a-half years post-partum a cardiovascular risk factor assessment was performed in women who developed gestational hypertension or pre-eclampsia at term. Women were identified from the Hypertension and Pre-eclampsia Intervention Trial at Term (HYPITAT) [10].

The cardiovascular risk factor assessment included measurements of blood pressure, weight, height, hip and waist circumference. Venous blood samples were taken after an overnight fast for glucose, HbA1c, insulin, total cholesterol, HDL cholesterol, triglycerides and HsCRP and micro-albuminuria and all participants were asked to fill out a medical questionnaire, including medical history, current use of medication, obstetric history, subsequent pregnancy after index pregnancy and family history, including CVD. Hypertension was defined as systolic blood pressure $\geqslant$140 mmHg, or a diastolic blood pressure $\geqslant$90 mmHg or current use of antihypertensive medication. For metabolic syndrome we used the definition of the International Diabetes Federation [11].

Women with a history of hypertensive pregnancy disorders at term had a higher prevalence of hypertension (34% versus 1%, OR 51.5, 95% CI 7.1–374) and metabolic syndrome (25% versus 5%, OR 6.0, 95% CI 2.3–15) 2.5 years post-partum, and they had more often unfavorable cardiovascular risk factors compared to women with a history of uncomplicated normotensive pregnancies [8].

Model development

We developed two separate Markov models based on the HyRAS trial: the first model focuses on hypertension screening and subsequent treatment with antihypertensive medication (Supplemental Fig. 1); the second model focuses on screening for metabolic syndrome and subsequent lifestyle intervention (Supplemental Fig. 2). Detailed descriptions of Markov decision analysis are available elsewhere [12,13]. We used cycles of one year. Markov models were developed and analyzed in TreeAge Pro 2009 Suite software (TreeAge Software, Inc, Williamstown, MA).

Model parameters

Women with a history of term gestational hypertension or term pre-eclampsia were eligible to enter the model at pregnancy at 31.7 years of age, the average age at delivery of women in the HyRAS database. The probabilities to develop hypertension or metabolic syndrome within two-and-a-half years after delivery were obtained from the same database, as were the probabilities to be treated for hypertension or metabolic syndrome without screening. The risk to develop hypertension or metabolic syndrome later in life is unknown for women with a history of term