Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health 5 (2015) 287–293

Contents lists available at ScienceDirect

Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health

journal homepage: www.elsevier.com/locate/preghy

Cerebrovascular, cardiovascular and renal hypertensive disease after hypertensive disorders of pregnancy

S.A.M. Schokker [a,*], M.F. Van Oostwaard [b], E.M. Melman [a], J.P. Van Kessel [a], M.I. Baharoglu [c], Y.B.W.E.M. Roos [c], L. Vogt [d], R.J. De Winter [e], B.W. Mol [f], W. Ganzevoort [a]

[a] Department of Obstetrics and Gynecology, Academic Medical Center, Amsterdam, The Netherlands
[b] Department of Obstetrics and Gynecology, Beatrixziekenhuis, Gorinchem, The Netherlands
[c] Department of Neurology, Academic Medical Center, Amsterdam, The Netherlands
[d] Department of Nephrology, Academic Medical Center, Amsterdam, The Netherlands
[e] Department of Cardiology, Academic Medical Center, Amsterdam, The Netherlands
[f] The Robinson Institute, School of Paediatrics and Reproductive Health, University of Adelaide, Australia

ARTICLE INFO

Article history:
Received 31 January 2015
Received in revised form 16 May 2015
Accepted 15 June 2015
Available online 22 June 2015

Keywords:
Gestational hypertension
Preeclampsia
Predictors
Stroke
Hypertensive kidney failure
Percutaneous transluminal coronary angioplasty

ABSTRACT

Background: Strong associations have been established in nationwide registry studies between hypertensive disorders of pregnancy (HDP) and later vascular morbidities and mortality. The aim of this case–control study is to examine the interdependent relationships of different predictive factors for vascular disease and HDP, because they are not clearly elucidated due to lack of detail in registries.

Methods and results: We assembled three different case groups of women who had cerebrovascular, cardiovascular, or hypertensive kidney disease before the age of 55. The control group consisted of age-matched women who underwent hysterectomy for benign reasons. We assessed the occurrence of HDP in previous pregnancies. The strength of the association with vascular morbidities was tested with multivariable logistic regression in comparison with classic vascular risk factors. In all case groups, previous HDP occurred more frequent than in the control group. In logistic regression analysis, previous HDP were the strongest predictor in the cerebrovascular group (OR 4.2; 95% confidence interval [CI] 1.6–11.0). In the cardiovascular group and the kidney failure group a similar association was found, however, this was not statistically significant (OR 4.4 (95% CI 0.82–4) and 2.9 (95% CI 0.61–14), respectively).

Conclusions: Previous hypertensive disorders of pregnancy are a strong predictor for later vascular morbidity. This is partially mediated through the presence of classic vascular risk factors, but our data suggest it is also an independent predictor.

Introduction

Hypertensive disorders of pregnancy (HDP) are a major health problem, both in frequency and impact [1–3], because they are associated with major, potentially life-threatening acute morbidity.

In recent years, it has become apparent that there is a strong association with long-term morbidity, compared to uncomplicated pregnancy [4]. Registry-based studies have shown that a history of HDP, increases the risk to develop coronary heart disease, stroke and kidney failure [5,6]. These associations are likely an expression of shared

* Corresponding author at: Academic Medical Centre, Department of Obstetrics and Gynecology, room H4-278 Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands.
E-mail address: s.a.schokker@amc.nl (S.A.M. Schokker).

http://dx.doi.org/10.1016/j.preghy.2015.06.002

underlying causes, such as the classic vascular risk factors among which the components of the metabolic syndrome [7–9]. It may however also be that HDP are associated with less known or untested shared underlying causes or that HDP causes persistent subclinical vascular damage [3].

In registry studies, the quantitative relationships between HDP and later cardio- and cerebrovascular disease have been established [5]. Nevertheless, registries mostly lack detail to elucidate the causal relationships of the different predictive factors for cardiovascular disease and their interdependent relationships. Studies with detailed data on important co-factors are paramount to examine the relationship between hypertensive disorders of pregnancy and cardiovascular and renal disease.

The aim of this case–control study of women with established vascular disease is to investigate the interdependent relationships of their association with obstetric history and independent cardiovascular and renal risk factors.

Methods

We performed a case–control study for which the institutional ethical review board (IRB) concluded that IRB-approval was not necessary under Dutch law.

For inclusions, see Fig. 1.

Case group: cerebrovascular disease

The case group for cerebrovascular disease consisted of women who suffered a stroke or Transient Ischemic Attack (TIA). Patients were identified from the Stroke Database of the department of Neurology of the Academic Medical Centre (AMC). Women were included if they were ⩽55 years at the time of the diagnosis and were initially treated in the AMC, or had been referred to the AMC for mechanical thrombolysis, in the period of January 1st 2008 until December 31st 2011. Women were excluded from the case group if they had a stroke due to a rare cause.

Case group: cardiovascular disease

The case group for cardiovascular disease consisted of women who underwent a percutaneous transluminal coronary angioplasty (PTCA). Patients were identified from the PTCA Database of the department of Cardiology in the AMC. Women were included if they were ⩽55 years at the time of the procedure and had the procedure in the AMC in the period of January 2008 until February 2010.

Case group: hypertensive kidney disease

The case group for hypertensive kidney disease (defined as hypertensive nephropathy or hypertensive nephrosclerosis) consisted of women who needed dialysis or a kidney transplant for terminal kidney failure. Patients were identified from the Renine Database, i.e. the Dutch registry for kidney replacement therapy [10]. Women were included if they were ⩽60 years when they started dialysis or received a kidney transplant in the period of January 1st 2007 until December 31st 2011 in the AMC. The age limit and selection period was broader to enlarge the number of women who matched the relatively rare inclusion criteria. Women were excluded from the case group if they had kidney failure due to congenital disorders, primary renovascular or primary glomerular and/or tubular kidney diseases.

Control group

The control group consisted of women under the age of 56, without stroke, myocardial infarction or kidney failure. Women for the control group were selected using the

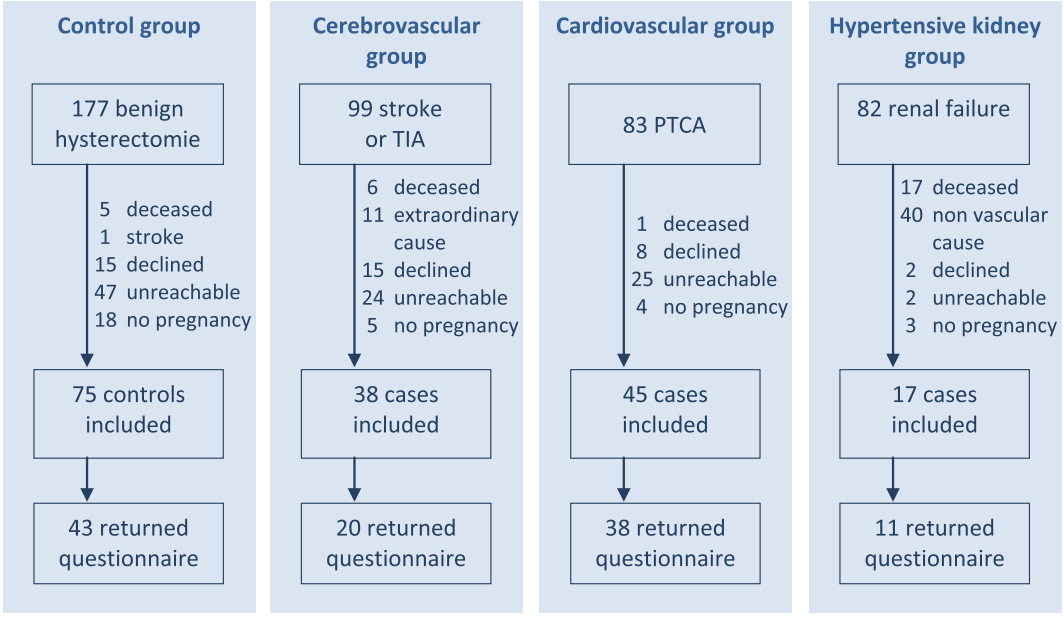

Fig. 1. Overview of the inclusion process of the control group and the 3 case groups.