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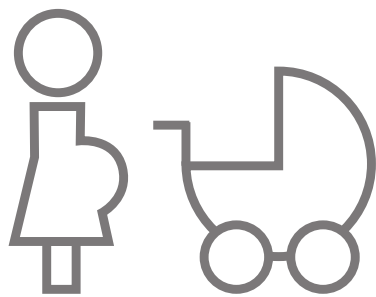
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CHAPTER

9

Prevention of cardiovascular risk
in women who had hypertension
during pregnancy after
36 weeks gestation

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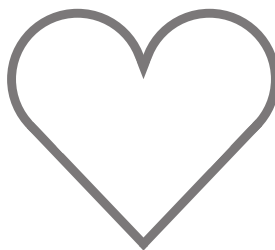
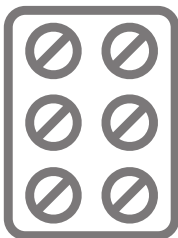
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ABSTRACT

Objective: Analyse of preventive interventions of women with cardiovascular risk factors postpartum.

Methods: 3.5 years postpartum, women with history of hypertension in pregnancy were invited for a questionnaire, one year after a cardiovascular risk assessment.

Results: 257 women completed the questionnaire. At risk factor analyses, 35% had hypertension, 37% abnormal lipid- or glucose levels, 63% BMI \geq 25 and 19% smoked. One year later, 36% of women with hypertension used antihypertensives, 0% of women with abnormal laboratory findings used anti-cholesterol and 1% anti-diabetes medication, 31% of the obese women achieved BMI reduction (\geq 5%), 42% of the women who smoked, quit.

Conclusion: A minority improved their risk profile.

INTRODUCTION

Cardiovascular disease is the most important cause of death in women in the Western World and a major cause of morbidity. In the Netherlands, heart disease and stroke was the cause of death in almost 30% of the women who died in 2012 [1]. The difference in clinical manifestations of cardiovascular disease between men and women might be a problem. Women have a greater tendency to present with atypical chest pain and indistinct complaints including unexplained fatigue, nausea and dyspnea. Ischemia may be more often silent and therefore the proportion of unrecognized myocardial infarction is greater in women [2,3]. In addition, diagnostic tools for women are less sensitive and specific than for men [2-5]. As a consequence most recommendations for observation, diagnosis and treatment are based on the presentation and model of cardiovascular disease in men. Overall this might result in increased prevalence of missed diagnosis in women [2,3]. In line with this observation, preventive treatment strategies for women at high risk for cardiovascular disease remain challenging.

Epidemiological studies have described an association between hypertensive disorders in pregnancy and cardiovascular disease later in life. Pregnancies complicated by hypertension have been suggested as “stress test for life” for later development of cardiovascular disease by underlying similar pathophysiological pathways [6-11]. This concept opens opportunities for preventive strategies for women [12-16], as hypertensive disorders in pregnancy might identify those women at risk of heart disease and stroke, at relatively young age.

Previous studies established the cardiovascular risk increment after a hypertensive disorder in pregnancy. Accordingly the American heart association guideline on the prevention of cardiovascular disease in women advises a yearly follow up on blood pressure, lipid and glucose spectrum after hypertension in pregnancy [17]. However there is limited knowledge on the prescription of and compliance to preventive interventions if these women are told to have specific risk factors.

Therefore, we are interested if women and their physicians are sufficiently aware of the increased risks for cardiovascular disease after a hypertensive disorder in pregnancy, when specifically informed of a risk factor. At 3.5 years postpartum, we analyzed intervention rates including the use of medication and lifestyle changes as body mass index (BMI) reduction and smoking cessation, in women who had a pregnancy complicated by hypertensive disorders.

METHODS

Study population

Figure 1 shows the timeline of the study. Between October 2005 and March 2008, women with a pregnancy complicated by mild preeclampsia or gestational hypertension after 36 weeks of gestation were included in an open-label randomized controlled trial of induction of labour versus expectant management, the HYPITAT study [18]. Mild preeclampsia was defined as diastolic blood pressure of 90 mm Hg or higher combined with proteinuria. Gestational hypertension was defined as diastolic blood pressure of 95 mm Hg or higher. The HYPITAT study found that induction of labour was associated with a decrease of high risk situation and should be advised for

women with mild hypertensive disease beyond 38 weeks' gestation [18].

Two and a half year after the HYPITAT index pregnancy, a random sample of the women was invited to participate in the Hypertension Risk Assessment Study (HyRAS) [19]. In summary, in this follow up study, 306 women with a history of preeclampsia or gestational hypertension after 36 weeks of gestation were screened for established modifiable cardiovascular risk factors 2.5 years postpartum. Major independent risk factors as defined according to the American Heart association including blood pressure, BMI and current smoking were determined in both groups [20].

After informed consent, women and their general practitioners were informed about the risk status in a letter by post, as agreed before inclusion on approval of the medical ethics committee. If women had an abnormal result, they were advised to make an appointment with their general practitioner. Their general practitioner received all results in detail, including a description letter with measured blood pressure, all the laboratory results and BMI. In case of abnormal results, further decision-making or advice on medication and lifestyle alterations was according to guidelines by the general practitioner [19].

Definitions

At the time of the HyRAS, 2.5 years postpartum follow up study we defined risk factors for cardiovascular disease as hypertension, defined as systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg or antihypertensive medication use, BMI ≥ 25 kg/m² and smoking. For this study relevant preventive interventions were defined as the use of antihypertensive, anti-cholesterol or anti-diabetic medication, BMI reduction with a decrease from the 2.5 year postpartum follow up study to the present survey by at least 5%, and smoking cessation.

We defined relevant observation of the risk factors as assessment at least once a year.

Questionnaire intervention study

One year after women had participated in the follow up study at 2.5 years postpartum, i.e. 3.5 years after their delivery, all 306 women were invited to participate in a telephone survey. When we were not able to contact women by phone, the questionnaire was sent by regular mail. The

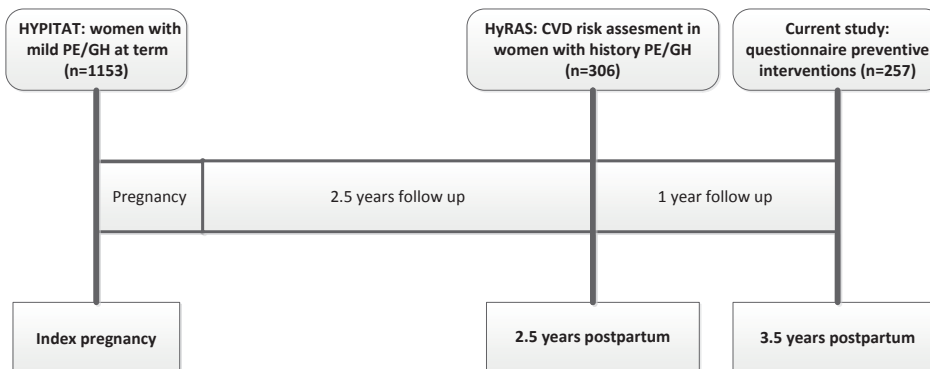


Figure 1. Timeline

questionnaire concerned interventions of the women, changing their cardiovascular risk factors, including the use of medication, lifestyle and lifestyle alterations including current weight and smoking.

Statistical analysis

SPSS version 18.0 was used for data analysis. Dichotomous baseline data were expressed as numbers and percentages, continuous baseline characteristics were presented as medians and inter-quartile ranges for the not normally distributed values.

RESULTS

Cardiovascular findings at 2.5 years postpartum

The questionnaires 3.5 year postpartum were completed by 257 of the 306 women with a history of hypertension in pregnancy, who participated in the HyRAS study (84%). At 2.5 years postpartum 144 of the cohort of 257 women with history of hypertension in pregnancy and their general practitioners received a letter confirming abnormal findings (56%) (**table 1**). The letters included an established hypertension for 91 of the women (35%). In 94 women abnormal lipid and/or glucose levels were found (37%). Of the 144 women, 41 had hypertension as well as an abnormal laboratory result. Therefore letters contained information about either abnormal blood pressure ($n=50$), abnormal lipid or glucose levels ($n=53$) or both ($n=41$). The remaining 113 women did not have abnormal blood pressure and/or laboratory results and therefore received a letter stating they had no risk factors. Furthermore at time of our 2.5 years postpartum risk factor analyses, 163 women had a $BMI \geq 25$ (63%). Smoking at 2.5 years postpartum, was reported by 48 of the women (19%).

Cardiovascular findings at 3.5 years postpartum

Concerning the 91 women with an established hypertension, one year later, at time of our questionnaire, there were 33 women using antihypertensive medication (36%) (**table 2**). Of these

Table 1. Baseline characteristics cardiovascular risk assessment study (2.5 years postpartum)

Characteristics	Women with history of PE or GH* (N=257)**
Primiparous (n, %)	102 (40%)
Hypertension (n, %)	91 (35%)
Abnormal lipid or glucose levels (n, %)	94 (37%)
Hypertension AND abnormal lipid or glucose levels (n, %)	41 (16%)
$BMI \geq 25$ (n, %)	163 (63%)
Smoking (n, %)	48 (19%)

* PE= Preeclampsia and GH= Gestational hypertension,

** Percentages based on 257 women participating in 3.5 years postpartum study

Table 2. Preventive interventions undertaken one year after risk assessment (3.5 years postpartum)

Risk factor, intervention	N intervention / N risk factor (%)*
Hypertension, antihypertensive medication	33 / 91 (36%)
Abnormal lipid or glucose levels, anti-diabetes or anti-cholesterol medication	1 / 94 (1%)
BMI \geq 25, BMI reduction at least 5%	50 / 103 (31%)
Smoking, stopped smoking	20 / 48 (42%)

* Number of women who undertook intervention / number of women with risk factor (percentage)

women with an established hypertension, only 48 women had their blood pressure checked by their general practitioners at least once a year (53%).

None of the 94 women with abnormal laboratory findings used anti-cholesterol medication while only one used anti-diabetes medication (1%). Of the women informed of abnormal lipid or glucose levels, 28 had these findings tested at least one a year (30%).

Of the 163 women with history of a hypertensive disorder in pregnancy, one year after the risk factor assessment, a significant BMI reduction of at least 5% was reported by 50 women (31%). At time of our survey, 20 of the 48 women smoking at 2.5 years postpartum stopped smoking (42%).

None of the women participating in our study reported having clinically manifest cardiovascular disease. One woman, had diabetes mellitus type 2 for which she changed their diet, but did not use any medication at time of our questionnaire.

DISCUSSION

We found that after screening for cardiovascular risk factors postpartum with feedback of the results to women and their general practitioners, preventive interventions were achieved only by a minority of the women with history of hypertensive disorder in pregnancy. Even though we specifically informed women and their general practitioners about an increased blood pressure, only one third of the women with a reported hypertension at 2.5 years postpartum used antihypertensive medication at the 3.5 years postpartum follow-up. As it is known that there is a direct and strong relation of blood pressure to vascular mortality at all ages, there is room for improvement [21]. When abnormal cholesterol and glucose results were found postpartum, there was no lipid lowering medication prescribed and only one woman used diabetes medication at time of follow up. At 2.5 years postpartum, we did not inform women specifically of an increased risk for cardiovascular disease due to BMI \geq 25 kg/m² and smoking, however we observed relatively the same intervention rates of 31% of the women for BMI reduction, and 42% of the women for smoking cessation, after one year.

Since current guidelines for general practitioners lack specific information for risk management after hypertensive disorders in pregnancy, it is not remarkable that awareness of women and their general practitioners is limited [22]. Currently there are no cardiovascular risk prediction models

specifically for women which include complicated pregnancy as a risk factor. According to most guidelines, women in our cohort do not fulfill the criteria for increased risk on morbidity and mortality caused by cardiovascular disease, due to their young age. However, latest American Heart Association Guidelines describe follow up of risk factors and CLASS I lifestyle interventions including weight reduction, smoking cessation, dietary advice and increasing physical activity [17].

In a previous study we found that 43% of women with a history of preeclampsia did not have blood pressure measurements postpartum in primary care [23]. Questions arise if women and their caregivers have a clear perception on the risks for cardiovascular disease after a pregnancy complicated by hypertension. We should consider that the lack of risk models and little evidence of guidelines do not contribute to creating awareness for preventive interventions after hypertension in pregnancy. Seeley et al describe in a focus group study, that knowledge of the association between a history of preeclampsia and future cardiovascular risk is generally lacking [24]. Several studies among postpartum caregivers revealed that there is limited knowledge of the association between hypertensive disorders in pregnancy and cardiovascular disease risks [25-27].

Accurate perceptions on cardiovascular disease risk have proven to be efficient in reducing cardiovascular risks [28]. Moreover, creating awareness is crucial but per se not sufficient for creating a healthy lifestyle postpartum. Hoedjes et al interviewed 36 women with a complicated pregnancy, they stated to be aware of the vulnerability of their health; however the majority did not change their own postpartum lifestyle [29]. Women experienced a lack of professional medical and psychological knowledge and support from their postpartum health caregivers as an important barrier in adopting a healthy lifestyle [28,29].

Lifestyle interventions following pregnancies complicated by hypertensive disorders have not been studied extensively. Women with a hypertensive disorder in their medical history might comply different to preventive interventions: besides their own health they feel foremost responsible for their newborn. In addition, if a pregnancy was complicated, readjustment to a normal lifestyle takes more time and preventive interventions might be neglected.

When looking at results of a general population of postpartum women, studies with tailored weight loss interventions, with both diet and exercise components, and smoking cessation programs with counseling were most effective [30,31]. It is unknown if these interventions are adequate for women with complicated pregnancies as well. Therefore future research should emphasize lifestyle interventions in a specific group of women with a pregnancy complicated by a hypertensive disorder.

After preeclampsia women report the need for professional follow up on their cardiovascular health, preferably 6 months postpartum [32]. Focus group interviews with women with a history of complicated pregnancy described that at 1 year follow up; all women expressed a need for postpartum lifestyle counseling. Preferably this counseling would be a combination of face-to-face counseling with a health care specialist and the use of computer-tailored lifestyle counseling [33].

In our study we informed women and their general practitioners about their risk status. Although we did not send specific guidelines in how to address our results, we created awareness for their

cardiovascular risk factors. Hopefully this would have led to anticipation on their risk profile by preventive interventions. Therefore it is even more striking that less than 50% of the women undertook specific preventive measures.

There are a few limitations to our study. To begin with, for calculation of the number of women who undertook a preventive intervention, we only considered medication as intervention in women with hypertension or abnormal laboratory results. Therefore we do not include specifically lifestyle interventions of these women. However, as we can see with BMI reduction in women with $BMI \geq 25$, if we take lifestyle interventions into account, the numbers of women undertaking these interventions, do not seem to increase. Furthermore, we send information on blood pressure and abnormal laboratory findings to the women and their general practitioners. In these letters we disregarded other important and modifiable cardiovascular risk factors including BMI and smoking status. Therefore we can only draw subtle conclusions on how the women and general practitioners anticipated on these findings. What we certainly can conclude by the results is that if women and their physicians are specifically informed about a high blood pressure and/or abnormal glucose and lipid levels, only a minority of the women undertook preventive interventions including medication use, BMI reduction or smoking cessation themselves. Additionally, there may be some inclusion bias as participating to the questionnaire was voluntary. Women who knew that they still had high blood pressure or abnormal laboratory findings may have been more likely to participate in the 3½ years postpartum survey. However, since there was no significant difference in response rate between women with and without a history of hypertension in pregnancy all groups are adequately represented in this study and it is not likely that inclusion bias has influenced the outcomes.

Lastly, since data were self-reported this may contribute to recall bias. In studies investigating self-reported weight, women tended to underestimate this [34]. Since at 2.5 years postpartum weight was measured by research nurses and at 3.5 years postpartum it was self-reported, this could lead to overestimation of BMI reduction in all groups. For this reason true intervention rates may be even lower in our study.

CONCLUSION

Identifying individuals at risk for cardiovascular disease at an early stage is a difficult problem. Women and health care professionals should consider a pregnancy complicated by hypertension as an important warning sign for increased risk for cardiovascular disease later in life. This may open a window of opportunities for preventive interventions. We demonstrated that there is a limited awareness at present and therefore only a minority of women who had hypertensive disorders in pregnancy receives adequate cardiovascular risk management. This limited awareness might result in a missed opportunity for early recognition of women who are at risk for cardiovascular disease later in life.

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