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Original Article

Influence of the couple on hypertensive disorders during pregnancy: A retrospective cohort study

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ABSTRACT

Objective: Our study investigates a possible couple predisposition for pregnancy-related hypertensive disorders (PRHDs).
Materials and methods: We selected 350 women with PRHDs and a random control cohort without PRHDs. We analyzed their clinical files and asked them and their partners about clinical information and family history for some common pathologies. Statistical bivariate and multivariate analysis was performed by R, considering significant $p < 0.05$.
Results: Familial history reveals in cases more maternal grandparents hypertension and thrombophilia, and paternal, personal and familial, thrombophilia history than in controls. By multivariate analysis, the occurrence of PRHDs is influenced by stress, maternal BMI, maternal chronic hypertension, pre-pregnancy diabetes mellitus, nulliparity, maternal grandmother and grandfather hypertension; and academic degrees is a protective factor. Selecting only multipara, PRHDs correlate with advanced maternal age, higher maternal BMI, chronic hypertension, longer interpregnancy interval, stress, previous pregnancies affected by PRHDs, and paternal, personal and familial, thrombophilia history. Moreover the multivariate logistic regression models considering parents familial and personal history results are accurate to predict PRHDs with an AUC of 79% in the general population and 82% among multiparous women.
Conclusions: The couple should be evaluated together for PRHDs risk, both parents familial history should be considered in PRHDs screening programs, and further studies are required, in a society continuously changing its characteristics and habits.

1. Introduction

Risk factors for pregnancy-related hypertensive disorders (PRHDs) have been widely investigated, pointing out also their possible heritability. In fact, both men and women who were the product of a pregnancy complicated by pre-eclampsia are significantly more likely to have a child from a pregnancy complicated by the same disorder [1]. Moreover Cnattingius et al. suggest that pre-eclampsia development may be influenced by the interaction between maternal and paternal genetic factors [2].

Familial history for diabetes type 2, over that for hypertension, reflects genetic and behavioral factors, whereby women may be predisposed to an increased pre-eclampsia

Abbreviations: PRHD, pregnancy related hypertensive disorder; BMI, body mass index; AUC, area under the curve; ROC, receiver–operator curve; GSTP1, glutathione S-transferase pi 1.

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risk [3]. The same may value for overweight and adiposity [4].

Paternal race, independently by maternal one, is involved in pre-eclampsia development, as also advanced paternal age by inducing new mutations in spermatocytes [5]. On the other hand, young paternal age seems to influence worse pregnancy outcomes too [6]. Paternal contribution to pre-eclampsia predisposition has been also investigated through molecular studies about GSTP1 polymorphism, which in the normal placenta plays a detoxification role [7].

Over paternal factors, even relational and sexual ones have been recently hypothesized [8,9], so that the change of partner and a higher interpregnancy interval seem to increase the pre-eclampsia risk [10,11].

From these perspectives pre-eclampsia may be defined a couple disease with primarily fetal and maternal manifestations [12]. Anyway, the literature lacks in a comprehensive analysis of couple risk factors to predict the development of PRHDs. The aim of our study is then to determinate if exists a couple predisposition to predict PRHDs, by investigating the relationship of such disorders with both maternal and paternal personal and familial history for some common pathologies.

2. Materials and methods

We selected 350 women affected by PRHDs who delivered in our clinic between 2004 and 2007. Then we chose a control cohort, by a random number generator algorithm program, of 350 women without PRHDs. We excluded patients with medically assisted reproduction pregnancies as described in a previous study [13].

After collecting women informed consent and with the official approval of the Local Reviewer Board, we contacted them by telephone to ask them and their partners about personal and clinical information. In particular, we focused on maternal and paternal familial history for some pathologies, as hypertension, diabetes, hypercholesterolemia, thrombotic pathology, dysthyroidism, epilepsia, cardiovascular pathology and tumors. Moreover we collected maternal information, pregnancy and neonatal outcomes from clinic's files.

We considered part of PRHDs group: pre-eclampsia, gestational hypertension and pre-eclampsia superimposed on chronic hypertension. According to the National High Blood Pressure Education Program, pre-eclampsia is defined by increased blood pressure accompanied by proteinuria. Diagnostic blood pressure increases are either a systolic blood pressure of greater than or equal to 140 mmHg or a diastolic blood pressure of greater than or equal to 90 mmHg. Proteinuria is defined as the urinary excretion of 0.3 g protein or greater in a 24 h specimen (this will usually correlate with 30 mg/dL or greater in a random urine determination). Gestational hypertension is defined the same as pre-eclampsia, but without proteinuria. Chronic hypertension is defined as hypertension present before the 20th gestational week [14].

Stress was considered only when present during the first and the second trimester of pregnancy, and it includes the following situations: psychological and physical strains at work, eventual work-place loss because of the pregnancy status, stress due to bad relationship with a relative, couple instability and separation, emotional involvement in any relative health problem, experience of a relative loss, anxiety about maternal health, pregnancy, fetal health and childbirth.

In our study we consider maternal infections those which required at least five consecutive days of antibiotic drugs administration during the first and the second trimester of pregnancy, and in particular we consider dental or periodontal disease those requiring at least 5 days of antibiotic drugs administration or surgical intervention by a dentist during the first or second trimester of pregnancy.

Statistical analysis was performed using R (version 2.10.1), considering significant a $p < 0.05$. Bivariate analysis was performed by *t*-test in case of continuous variables, and chi-square test or Fisher exact test in case of categorical ones. Also multivariate logistic regression analysis was performed.

3. Results

Contacted cases are 255 and controls 237. Among cases, 143 women were affected by gestational hypertension, 70 by mild pre-eclampsia and 41 by severe pre-eclampsia. For 113 normal pregnancies and 95 PRHDs, it was not possible to complete the follow-up because the patients could not be found, did not give their consent for the study or did not match the inclusion criteria.

Mean maternal pre-pregnancy BMI results are significantly ($p < 0.05$) greater in cases (25.82 kg/m^2 ± 6.32 vs 22.82 kg/m^2 ± 4.06), as also mean maternal age (33.39 years ± 0.50 vs 32.68 years ± 0.85) even if without the statistically significance (p 0.127). Maternal race is Caucasian in the most cases (84.98%) and controls (86.08%), but exists in a minority of Sub-Saharan African, East-European, Arabian, Asian, and South-American women. Women from the Sub-Saharan Africa, Asia and South America have a higher prevalence of PRHDs, but these differences in our sample do not reach the statistical significance.

Analphabetism or primary school level in cases are more common than in controls (9.84% vs 2.95%, $p < 0.05$) and the percentage of women with any academic degree is significantly higher in controls (30.8% vs 19.76%, $p < 0.05$). No significant difference can be noticed about maternal occupation or physical activity (Table 1).

Mean paternal age (36.04 years ± 0.44 in cases and 35.79 years ± 0.44 in controls) reveals no significant difference between the two groups, and paternal BMI results greater in cases (26 kg/m^2 ± 0.47 vs 25.47 kg/m^2 ± 0.18) but without the statistical significance (p 0.080).

Analysing other risk factors for PRHDs purposed by the literature, there seem to be no significant difference in case of either active or passive tobacco smoke nor maternal alcohol assumption during pregnancy, partner change after the previous pregnancy, different partner race, maternal and paternal personal and familial history for cardiovascular disorders or hypercholesterolemia, residence place