

The main risk factors for hypertensive disorders in pregnancy

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Abstract — The aim of provided study was to determine the frequency and significance of various risk factors for hypertensive disorders in pregnancy. Assessment of women at risk for hypertensive disorders is very important for antenatal care. Various risk factors were studied in 120 women with hypertensive disorders in pregnancy, and the study found that the presence of one risk factor for hypertensive disorders was determined in 25% of the cases, a combination of two risk factors was observed in 24.2% of cases, three or more - in 21.7% of cases. It was found that 29.1% of pregnant women with preeclampsia and gestational hypertension have no any risk factors. The most significant risk factors for hypertensive disorders during gestation are the first pregnancy and the presence of somatic pathology of the pregnant woman. The study suggests that the combination of three or more risk factors for hypertensive disorders is a predictor of an increased risk of developing severe forms of preeclampsia, and the absence of risk factors does not negate the possibility of preeclampsia and requires the search for other early markers of this pathology.

Keywords—pregnancy; hypertensive disorders; risk factors; preeclampsia

I. INTRODUCTION

Hypertensive disorders (HD) are among the most complicated and unsolved problems in modern obstetrics. The prevalence of this pathology is quite high (from 12 to 40%) and has no tendency to decrease [1, 2]. HD in pregnancy are in second place among the leading causes of maternal mortality. About 63000 women die from preeclampsia (PE) and eclampsia every year in the world, which, according to WHO (2006), accounts for 16 % of maternal mortality [1]. The ration of HD is growing on the background of somatic pathology (70 %) with early clinical manifestations and a more severe course of disease [2, 3, 4].

Preeclampsia complicates 3 to 5% of all pregnancies, and it is a major cause of maternal and perinatal morbidity and mortality worldwide [3].

Today, many different theories explain the causes of hypertensive disorder in pregnancy - endothelial, neurogenic, hormonal, immunological, placental, genetic, etc. [8,9,10,11,12]. In recent years, many studies have been conducted on clinical predictors of the risk of development of preeclampsia [13]. During the meta-analysis, the influence of the following factors on the risk of development of preeclampsia was assessed: age, history of childbirth and preeclampsia, preeclampsia in mother, multiple pregnancies, background diseases, and the interval between pregnancies, body mass index, blood pressure (BP) level and confirmed proteinuria.

Age over 40 years doubled the risk of development of preeclampsia (relative risk - RR - 1.68) regardless of the history of childbirth. The young age of the pregnant did not affect the magnitude of the risk. According to three cohort studies, it was determined that the risk of development of preeclampsia in nulliparous is 3 (three) times higher than in multiparous (RR 2.91). According to six case-control studies, women suffering from preeclampsia were two times more likely to be nulliparous (RR 2.35). According to five cohort studies in women who had preeclampsia in their first pregnancy, the risk of development of preeclampsia increases in their second pregnancy seven times (RR 7.19). This pattern was confirmed by the seventh case-control study: women with preeclampsia in the second pregnancy were seven times more likely to have preeclampsia in the first one (RR 7.61). The presence of preeclampsia in the history of the mother increases the risk of preeclampsia in the daughter (RR 2.90) almost three times, - confirmed by two cohort studies. Multiple pregnancy is also a risk factor: the presence of twins nearly triples the likelihood of developing preeclampsia (RR 2.93 - based on five cohort studies) [6].

According to three cohort studies, it was found that the presence of insulin-dependent diabetes increases the risk of preeclampsia by almost four times (RR 3.56). Risk factors are also hypertension, kidney disease, and autoimmune diseases among background chronic diseases.

Two cohort studies examined the effect of antiphospholipid antibodies (APS) on the risk of developing preeclampsia - it increased sharply (RR 9.72) [5].

Several studies have found that a longer duration of time between pregnancies is also a risk factor for preeclampsia: with an interval of more than 10 years, the risk of developing preeclampsia approaches the risk of nulliparous; on the average interval, the RR increases by 1.23 each year of the time interval between childbirth.

An increased body mass index also significantly increases the risk of preeclampsia (RR 2.47 - based on six cohort studies).

Several studies have determined the effect of blood pressure at the first visit of a pregnant woman. In women who subsequently had preeclampsia, both systolic and diastolic pressures were higher during the first visit. Diastolic pressure over 80 mmHg caused the development of preeclampsia RR 1.38. None of the studies tested women without background kidney disease in the presence of proteinuria at the first visit of pregnant woman [14].

Risk factors for the development of hypertensive disorders in pregnancy were identified by summarizing the data of numerous studies of foreign and domestic authors. These include the first pregnancy, the presence of preeclampsia and eclampsia in the history, the interval between births up to 2 years and over 10 years, the age of pregnant women under 18 years old and over 35 years old, overloaded family history of preeclampsia, multiple pregnancy, other somatic diseases of the mother, etc. However, it should be noted that hypertensive disorders quite often complicate the course of pregnancy in women in the absence of risk factors for preeclampsia as well [15-17].

In this regard, the problem of protecting the health of mother and child in hypertensive states requires the intensification of scientific research aimed at improving the assessment of the risk of developing hypertension in pregnancy and developing methods for its prevention and treatment.

The purpose of the study was to examine the frequency and significance of various risk factors of the development of hypertensive disorders in pregnancy.

II. MATERIALS AND METHODS

Various risk factors were studied in 120 pregnant women with hypertensive disorders in pregnancy (main group) and 50 healthy pregnant women at the same gestational age (control group). The presence or absence of risk factors for the development of

preeclampsia was assessed in pregnant women: age, parity, hypertensive disorders in previous pregnancies, obesity, and overloaded family history of hypertension, the interval between pregnancies, infertility, multiple pregnancy, and somatic diseases.

During provided work we examined 120 women with hypertensive disorders caused by a real pregnancy in gestational periods over 20 weeks of pregnancy (I main group), and the control group consisted of 50 pregnant women at the same gestational age with a normal pregnancy without hypertensive disorders.

The diagnosis of hypertension in pregnant women was made according to the ICD - 10th revisions applied in the Republic of Azerbaijan since 2009. Patients of the main group, depending on the severity grades of hypertensive disorders, were divided into two subgroups: Subgroup 1 - 58 pregnant women with gestational hypertension; and Subgroup 2 - 62 patients with preeclampsia. According to generally accepted criteria, general and obstetric histories of all patients were collected. The study revealed the presence of past diseases and investigated reproductive function, outcomes of previous pregnancies, and the nature and complications of previous pregnancies. The presence or absence of risk factors for the development of preeclampsia was assessed in pregnant women: age, parity, hypertensive disorders in previous pregnancies, obesity, and overloaded family history of hypertension, the interval between pregnancies, infertility, multiple pregnancy, and somatic diseases. The study was conducted following the standards of Good Clinical Practice.

Digital data obtained during the study were processed by methods of statistical variance with the calculation of the arithmetic mean of the study sample (M), minimum (min), and maximum (max) value of the series. The nonparametric White's test (W-test) was used to assess the differences between the compared groups. The Pearson χ^2 criterion was used to assess the relationship between quality attributes.

III. RESULTS AND DISCUSSION

The study found that the presence of one risk factor in hypertensive disorders was determined in 30 patients (25%), a combination of two risk factors was observed in 29 pregnant women (24.2%), three or more - in 21,7 % of cases (26 women). It was found that 29.1% of pregnant women with preeclampsia and gestational hypertension have no risk factors. Table 1 shows the frequency of occurrence of individual risk factors for hypertensive disorders in pregnant women.

TABLE I. The rate of the main risk factors for Hypertensive disorders in main and control groups

Risk factors for hypertensive states	Main Group (n=120)		Control Group (n = 50)		P
	Number	%	Number	%	
First pregnancy	85	70,8	22	44	<0,05
History of the presence of preeclampsia and eclampsia	16	13,3	-		-
The interval between births up to 2 years and over 10 years	14	11,7	3	6	<0,05
Overloaded family history of preeclampsia	21	17,5	4	8	<0,05
A history of infertility	29	24,2	4	8	<0,05
Pregnant women under 18 years old and over 35 years old	15	12,5	5	10	>0,05
BMI> 35	26	21,7	3	6	<0,05
Multiple pregnancy	10	8,3	1	2	<0,05
Somatic disease in mother	34	28,3	7	14	<0,05
No risk factors	35	29.1	28	56	<0,05

Based on the analysis of anamnestic data, it was found that the age of the patients of the main group ranged from 18 to 40 years. The average age was 28.5 years, and 12.5% of the examined were over the age of 35, 87.5% of the patients were in the age range from 18 to 35 years. Nulliparous women accounted for 70.8%, multiparous women - 29.2% of the examined. A study of obstetric and gynecological history showed that primary infertility was observed in 14.2% of pregnant women, secondary infertility - in 10% of cases, overloaded obstetric history occurred in 74.2% among multiparous pregnant women. The study of somatic status revealed a statistically significant (<0.05) high frequency of concomitant pathology: obesity of different severity (BMI> 35) - 21.6%, kidney and urinary tract diseases - 9.2%, hypertensive disease, and cardiovascular pathology - 6.7%, endocrine diseases - 8.3%, and chronic cholecystitis - 4.2%. Overloaded family history of hypertensive disorders was found in 17.5% of cases. Thus, the majority of women were nulliparous, and every third of them had a weakened somatic status, which allowed them to be attributed to the group of increased risk of

developing hypertensive disorders in pregnancy. The most frequently viewed somatic diseases were chronic kidney disease, chronic high blood pressure, migraines, type 1 or type 2 diabetes, thrombophilia/coagulopathy, or lupus. According to several provided scientific works the presence of preeclampsia may increase the risk of cardiovascular disease in future. The risk is even greater if woman had preeclampsia more than once or had a preterm delivery [18].

It turned out that approximately every third patient with hypertensive disorders had no risk factors, and accordingly, the development of gestational hypertension and preeclampsia was not initially expected. The presence of one risk factor was determined in 30 patients (25%), a combination of two risk factors was observed in 29 pregnant women (24.2%), three or more risk factors - in 21.7% of cases (26 women).

We have studied the relationship between the frequency of risk factors and the severity grades of hypertensive disorders (Table 2). It turned out that in the absence of presence of one or a combination of two risk factors, gestational hypertension and preeclampsia occurred approximately at the same frequency, and there were no statistically significant differences in the groups ($p > 0.05$), i.e., these parameters do not affect the severity grades of hypertensive disorders. However, in a combination of three or more risk factors, statistically significant preeclampsia rate is more than gestational hypertension three times.

TABLE II
Dependence of risk factors for preeclampsia and severity of hypertension

Risk factors for hypertensive states	Gestational hypertension (n = 58)		Preeclampsia (n=62)		P
	N	%	N	%	
No risk factors	17	29,3	19	30,6	>0,05
The presence of one factor	17	29,3	5	21	>0,05
The presence of two factors	14	24,1	15	24,2	>0,05
The presence of three or more factors	6	10,3	20	32,3	<0,01

IV. CONCLUSION

The analysis of risk factors for hypertensive disorders in pregnancy allows identifying pregnant women in a high-risk group of the development of preeclampsia

starting from the first trimester of gestation. Hypertensive disorders in pregnancy are observed in 29.1% of cases in women who are not at risk for the development of this pathology. The most significant risk factors for hypertensive disorders during gestation are the first pregnancy, the presence of somatic pathology in the pregnant woman, and the presence of preeclampsia and eclampsia in the anamnesis; a combination of three or more risk factors of the development of hypertensive disorders is an anamnestic marker of an increased risk of developing severe forms of the disease. Thus, the analysis of the obtained data allowed us to identify anamnestic criteria for increased and low risk of development of preeclampsia in the first trimester of pregnancy by the presence of risk factors for hypertensive disorders. A further in-depth examination of these women will make it possible to begin the prevention of hypertensive disorders in early pregnancy and monitor the hemostatic system, the condition of the fetus, and improve pregnancy outcomes. The absence of risk factors does not negate the possibility of preeclampsia and requires the search for other early pathogenically substantiated markers of this pathology.

ACKNOWLEDGMENT

I acknowledge the contributions of my working staff and Dr.Prof. Jamila Fazil Qurbanova for their roles in guiding this work to successful completion. The patience and endurance of my family for the busy period and my absence are well acknowledged and appreciated.

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