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Prevention and Treatment of Cardiac Rhythm Disorders in Pregnant Women with Arterial Hypertension

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Objective. To prevent and assess cardiac rhythm disorders (CRDs) and conduction disorders in pregnant women with gestational and chronic arterial hypertension .

Materials and Methods. We analyzed data from 44 pregnant women examined at the outpatient department of the Republican Specialized Research Center of Cardiology, Fergana Branch (RSRCC FB), from January 2026 to August 2026. The mean age of the patients was 22.2 ± 5.04 years. Examinations were performed at gestational ages ranging from 5 to 37 weeks (mean, 21.0 ± 5.4).

Results. According to Holter monitoring findings, CRDs occurred in 57% of patients with chronic and gestational hypertension. Of these, 45% had an asymptomatic course and 55% had a symptomatic course. All symptomatic and asymptomatic pregnant women underwent Holter monitoring. CRDs before pregnancy had been documented in 10 patients. Monitoring identified CRDs in 28 patients (63%), whereas no CRDs were detected in 16 pregnant women (36%). Among the CRDs, ventricular extrasystoles were recorded in 45% of pregnant women, supraventricular extrasystoles in 35%, and paroxysmal tachycardia in 20%; episodes of sinus tachycardia were also observed.

Conclusion. The CRDs observed in patients with chronic and gestational hypertension did not require termination of pregnancy. Antiarrhythmic therapy prescribed for symptomatic, hemodynamically significant, and life-threatening CRDs made it possible to effectively manage pregnant women until delivery under dynamic follow-up. In most patients, delivery occurred at term, and no CRDs were observed during labor. The newborns had high Apgar scores.

Keywords: cardiac rhythm disorders, pregnancy, beta-blocker, methyldopa, Holter monitoring

Conflict of interest: none declared.

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BP - blood pressure
AV block -atrioventricular block
EH - essential hypertension
VT -ventricular tachycardia

SVT -supraventricular tachycardia
VE-Ventricular extrasystole
SE-Supraventricular extrasystole
HRD - heart rhythm disorder
RFA - radiofrequency ablation
CVD - cardiovascular disease
ECG - electrocardiography
SVR-systemic vascular resistance
EchoCG – echocardiography
AADs -antiarrhythmic drugs.

During pregnancy, the cardiovascular system assumes an extensive role in adapting the maternal body to the growing hemodynamic demands of the fetus. Physiological changes in the cardiovascular and neuroendocrine systems that occur in the pregnant body can contribute not only to the clinical manifestation of various heart rhythm disorders but also to the exacerbation of existing cardiac pathology. Arrhythmias during pregnancy are not uncommon, but they are not frequent enough to be well characterized. Currently, given the wide prevalence of extragenital pathology in pregnant women, cardiology specialists need to understand the full depth of the etiopathogenesis of cardiovascular disorders during gestation, expand their knowledge in related fields of medicine, and improve their approach to the treatment of such patients, taking into account the presence of various comorbidities.

Physiological changes such as increased circulating blood volume (CBV), cardiac output, and heart rate, as well as hormonal shifts, can provoke the onset of arrhythmias in healthy women or exacerbate existing ones. [6.7]

Pathophysiology of Arrhythmias During Pregnancy

Maternal hemodynamics undergoes profound changes throughout pregnancy: significant changes begin shortly after conception, peak in the second and early third trimesters, and remain relatively stable until the onset of labor. These hemodynamic changes play a key role in supporting the developing fetus and adapting to the changing demands of pregnancy. The increased susceptibility to arrhythmic events in pregnant women is due to a complex interplay of autonomic, hormonal, and cardiovascular modifications. In particular, elevated plasma catecholamine levels, increased ventricular end-diastolic volume resulting from intravascular volume expansion, the mechanical effect of atrial stretching, and the multifaceted influence of hormonal and emotional changes together contribute to the formation of a proarrhythmic environment (Figure 1).

Mechanism of Arrtythmia Development During pregnancy.

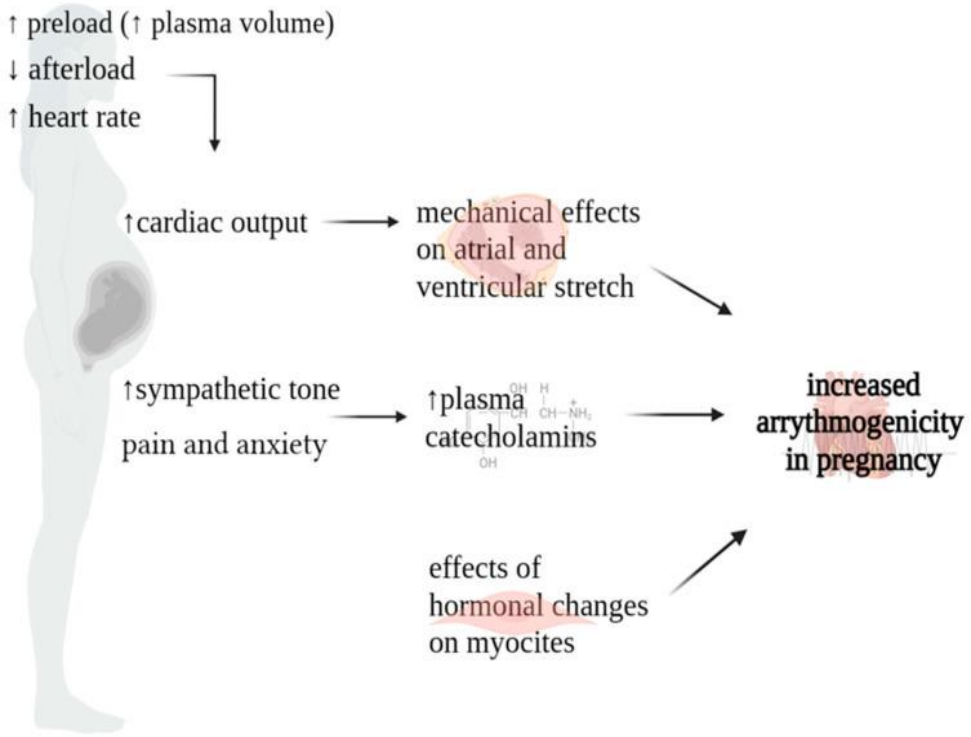


Figure 1.

Cardiac output increases throughout pregnancy. The increase occurs as early as the sixth week of pregnancy, persists until 20–24 weeks, and peaks at 30–50% above the prepregnancy baseline. [1] In cases of multiple pregnancies, this increase becomes more pronounced, with cardiac output levels rising by 60–70%. This surge is driven by changes in three key factors that determine cardiac output: (a) increased preload due to plasma volume expansion; (b) decreased afterload due to reduced systemic vascular resistance (SVR); and (c) increased heart rate. In the early stages of pregnancy, plasma volume gradually increases by 10–15%, and by 30–34 weeks it increases to 40–50% compared with prepregnancy levels. [2] The concurrent decrease in systemic vascular resistance (SVR) is explained by a combination of factors. First, the uteroplacental circulation creates a low-resistance circuit. Second, estrogen-induced vasodilation plays an important role, with estrogen promoting nitric oxide formation. Finally, in the first trimester, there is an increase in resting heart rate, averaging 10–30 beats per minute. This upward trend persists, gradually intensifying, until it peaks at 34 weeks, with a maximum heart rate of 91 beats per minute. Subsequently, at 40 weeks, a slight decrease is noted: the median heart rate settles at 89 beats per minute. This increase in heart rate is likely related to hormonal changes in the early stages of pregnancy, while the later increase is associated with an increase in left atrial diameter and sympathetic activation. [5] The diagnosis and treatment of arrhythmias in pregnant women represent a complex clinical challenge, as the attending physician must balance the efficacy of

therapy for the mother against potential risks to the fetus, including the teratogenic and fetotoxic effects of antiarrhythmic drugs (AADs).

Clinical and anamnestic characteristics of the patients included in the study (Figure 2)

Indicators	Number of patients
Age	21±5,4 лет
Arrhythmia duration	0,5±2,5 лет
Family history	28±1,5(60%)
Smoking/ Alcohol use	0%
Main diseases	
Chronic arterial hypertension	30 (68%)
Gestational arterial hypertension	14 (32%)
Congenital heart diseases	0%
Vegetovascular dystonia	0%
Myocardits	0%
Idiopathic rhythm disorder	5%
	1(2,2%)
Concomitant pathology	3(6,8%)
Thyroid diseases	4(9%)
Gestational diabetes mellitus	3%
Respiratory pathology	2%
Renal pathology	
Gastrointestinal pathology	2(4%)
	18(42%)
Distribution by trimester of pregnancy	24(54%)
First	
Second	12(27%)
Third	9(20%)
	23(53%)
	13(29%)

Pregnancy
First
Second
Third
History of spontaneous abortion.



In the management of pregnant women with CRDs, the main directions are the diagnosis and treatment of cardiovascular diseases (CVDs) and concomitant pathology that contribute to the development of cardiac arrhythmias. In addition, it is necessary to identify and eliminate factors that may provoke CRDs: alcohol consumption, caffeine, smoking, and psychoemotional stress. In many cases, implementation of the above measures is sufficient for the prevention or relief of a number of arrhythmias.

In our practice, we first ruled out organic heart disease. In 30 pregnant women (68%), essential hypertension (EH) was diagnosed; antihypertensive therapy was administered with achievement of target blood pressure (BP) levels. In 14 (32%), gestational arterial hypertension was diagnosed; antihypertensive therapy was administered with achievement of target BP levels. In 7 patients (75%), CRDs were detected before pregnancy; the duration of arrhythmological history was 5.9 ± 1.1 years. No history of syncopal or presyncopal states was identified. An analysis of concomitant pathology identified through review of medical records, questionnaires, and inpatient examination was performed. In the patients, diffuse nodular goiter with thyroid hypofunction was detected (hormone therapy was used), in one — respiratory disease (chronic bronchitis), in 3 — chronic pyelonephritis, in 4 — gastrointestinal tract (GI tract) pathology (chronic gastritis, duodenitis). In 33 patients (43%), iron-deficiency anemia of mild and moderate severity was present during the current pregnancy; appropriate therapy was administered. As a rule, the pregnant women did not have severe concomitant pathology, and the existing chronic diseases were in remission. All patients had lifestyle-related factors provoking CRDs, such as psychoemotional stress and harmful occupational conditions. When collecting anamnesis, all women denied the presence of such unfavorable factors as smoking, alcohol, and drug use. Twenty-five women reported psychoemotional stress. For neuroses, sedatives of plant origin were prescribed.

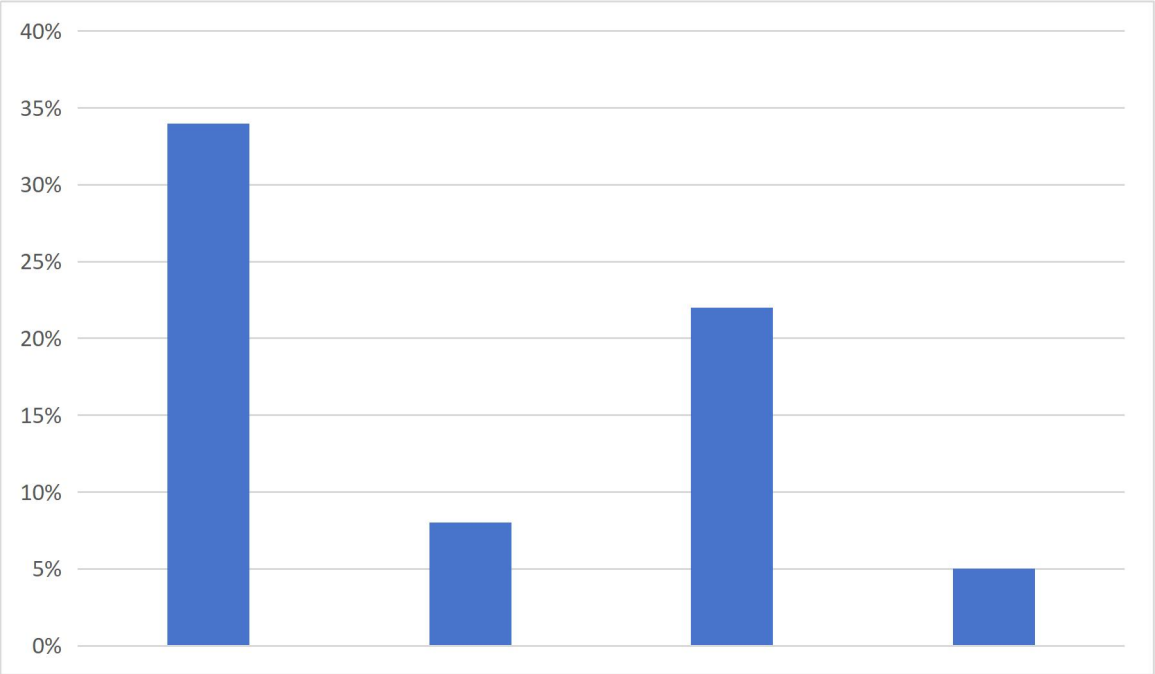
Analysis of EchoCG parameters revealed an increase in stroke volume (67.49 ± 11.10 mL), which contributes to an increase in cardiac output (Figure 3). This is explained by developing physiological hypervolemia, which is one of the main mechanisms maintaining optimal

microcirculation in the placenta and in the vital organs of the mother and fetus. The remaining structural and functional cardiac parameters were within normal limits (Table 2). It was found that the most common type of CRD was extrasystolic arrhythmia: PVCs occurred in 15 pregnant women (34%), PACs in 8 (18%). Episodes of SVT were recorded in 9 (22%) (Figure 5). The indicated CRDs were not life-threatening situations, in most cases did not require any treatment, and did not affect the course and outcome of pregnancy. In rare cases, with poor subjective tolerance of extrasystole, drug therapy was prescribed. To date, there are no fetal-safe antiarrhythmic drugs, therefore their

EchoCG Parameters of Patients Included in the Study. Figure 3.

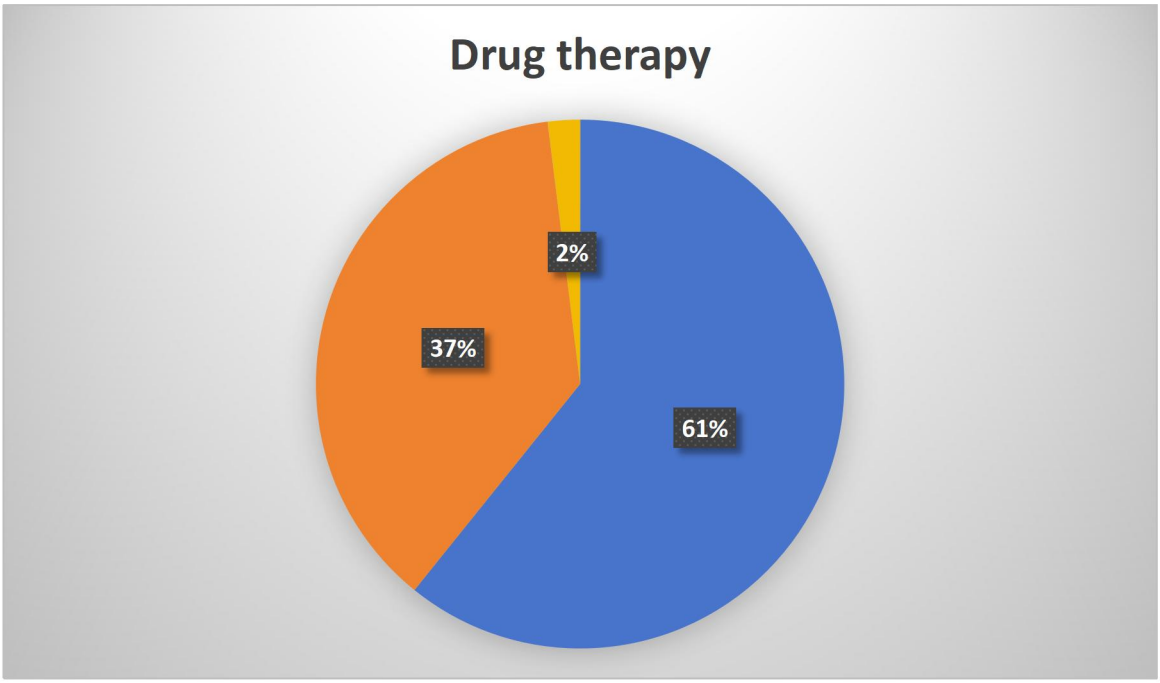
Indicators	Me(Q25;75;)
Left ventricular ejection fraction (by Simpson)	67.0(56.0;75)
End-diastolic volume, mL	100.0(53.0;1)
End-systolic volume, mL	30,0(23,0;52)
End-diastolic index	56.1(37.0;68)
End-systolic index	16.4(12.6;28)
Myocardial mass index	73.0(49.0;
Systolic pressure of the right ventricle	107,0)
Stroke volume	24.0(20.0;300
Cardiac index	)
	68.0(45.0;97)
	3.0(1.7;5.3)

Frequency of Diagnosis of Various CRD Figure 5.



1- Ventricular extrasystole
2-Supraventricular extrasystole
3- Supraventricular tachycardia
4-AV-block.

Figure 6.



Not performed

Metoprolol

Allapinin

To date, there are no fetal-safe antiarrhythmic drugs; therefore, they are used during pregnancy only according to strict clinical indications — the treatment of symptomatic, hemodynamically significant, or potentially life-threatening CRDs. The prescription of antiarrhythmic drugs was carried out according to fetal safety criteria. Drugs of categories B and C were prescribed (according to Food and Drug Administration (FDA) recommendations) [Figure 4]. Drugs were prescribed at the minimum effective dose, mainly for the relief of CRD episodes or as a short course; prescription of drug therapy in the first trimester of pregnancy and combinations of antiarrhythmic drugs was avoided. Drug intake in the inpatient setting was carried out under ECG and BP monitoring. After discharge, daily monitoring of BP, pulse, and keeping a self-monitoring diary were recommended. Three (7%) patients took metoprolol for frequent PVCs; 2 symptomatic pregnant women (2%) took the class 1C antiarrhythmic drug Allapinin for frequent supraventricular extrasystole with episodes of paroxysmal tachycardia (Fig. 5). Unstable episodes of VT were not recorded.

Fig. 1. Frequency of diagnosis of various CRDs. Abbreviations: AV block — atrioventricular block, PVC — ventricular extrasystole, SVT — supraventricular tachycardia, PAC — supraventricular extrasystole (Fig. 6.) Drug therapy. and they can occur against the background of complete somatic health of the woman (they have a functional genesis) 3.

However, arrhythmias during pregnancy represent a particular problem, since they can complicate the course of the gestational period and have an adverse effect on the condition of the fetus and mother in patients with chronic and gestational hypertension. In pregnant women with CRDs, malignant gestoses, miscarriage, and fetal hypotrophy are more common [4]. A key aspect of our work was the assessment of the influence of CRDs of various origins in patients with chronic and gestational hypertension on the course of pregnancy and labor; this work was carried out jointly with obstetrician-gynecologists of the regional perinatal center. In no case was a negative influence of CRDs on the course of pregnancy and fetal development established, provided that the pregnant woman was co-managed by a team of cardiologist-arrhythmologists and obstetrician-gynecologists. Delivery occurred on average at 38–39 weeks of gestation; in 15 patients (34%) by cesarean section, and in the rest — spontaneous labor. The average Apgar score of the newborns was 8.64 (immediately after birth)/9.35 (at 5 minutes). In two patients, labor was preterm; an emergency cesarean section was performed in one at 29 weeks of gestation, and in the second at 36 weeks of gestation. Preterm labor was due to obstetric pathology and was not associated with CRDs. No CRDs were observed during labor in any patient; ECG and BP monitoring was carried out both during spontaneous delivery and during operative delivery.

Figure

FDA Pregnancy Categories	
Category	
A	Adequate and well-controlled studies have failed to demonstrate a risk to the fetus in the first trimester of pregnancy (and there is no evidence of risk in later trimesters).
B	Animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well-controlled studies in pregnant women.
C	Animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well-controlled studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.
D	There is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.
X	Studies in animals or humans have demonstrated fetal abnormalities and/or there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risks involved in use of the drug in pregnant women clearly outweigh potential benefits.

7.

Conclusion

Cardiac rhythm disorders observed in patients with chronic and gestational hypertension did not require termination of pregnancy. Antiarrhythmic therapy prescribed for symptomatic, hemodynamically significant, and life-threatening CRDs made it possible, under dynamic follow-up, to effectively manage pregnant women until delivery. In most patients, delivery occurred at term, and no CRDs were observed during labor. The newborns had high Apgar scores.

Conflict of Interest: All authors declare that there is no potential conflict of interest requiring disclosure in this article.

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