

## **Analysis of Risk Factors for Congenital Heart Diseases in Children**

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### **Author's contribution**

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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### **ABSTRACT**

**Introduction:** The article analyzes the risk factors that contribute to the development of congenital heart defects in children.

**Materials and Methods:** We analyzed 162 case histories of children with congenital heart defects who received treatment in the cardiac surgery department of the clinic.

**Results:** The leading risk factors were established: Anemia (48.5%), chronic placental insufficiency (38%), threatened abortion (32.7%), toxicosis of the first half of pregnancy (22.3%) and acute viral infection transmitted in the early stages pregnancy (21.3%).

**Conclusion:** Pregnant women at risk of congenital heart defects of the fetus need close attention and screening, fetal echocardiography, consultation and observation by a pediatric cardiologist from the intranatal period. Carrying out preventive measures can significantly reduce the risk of having a baby with congenital heart diseases.

*Keywords: Risk factors; congenital heart diseases; children.*

### **1. INTRODUCTION**

Congenital heart defects are one of the most common congenital malformations in children

(30% of all congenital malformations); they occupy third place in frequency of occurrence after congenital pathology of the musculoskeletal system and central nervous system [1,2,3]. The

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causes of congenital heart defects are not fully understood. Potentially dangerous for the formation of pathology of the cardiovascular system of the fetus, risk factors are numerous and can be combined. These include congenital and acquired diseases of the mother and fetus, as well as teratogenic environmental factors. Of great importance in the occurrence of defects is hereditary pathology (chromosomal and gene mutations), infectious, primarily viral diseases [2,3,4]. Identification of risk factors for the birth of a child with congenital heart disease is important not only from a theoretical, but also from a practical point of view in order to predict the risk of development and plan adequate preventive measures to reduce them.

Congenital heart diseases are classified as multifactorial diseases, since in their etiology along with genetic factors a certain role is played by the presence of bad habits in the child's parents and the maintenance of an unhealthy lifestyle [5,6]. To date, there has been a redistribution in the ranking of risk factors for the occurrence of congenital heart defects. Thus, according to available data, the leading risk factors for giving birth to a child with congenital heart disease are: the age of the mother, endocrine disorders in spouses, toxicosis in the 1st trimester and the threat of termination of pregnancy, a history of stillbirth, the presence of other children with congenital malformations.

Other authors refer to the leading risk factors for the birth of children with congenital heart defects: medical abortion in the history of the mother; cytomegalovirus, herpetic infections, ureaplasmosis, viral hepatitis B, chlamydia, syphilis; anemia and exacerbation of chronic maternal diseases during pregnancy; smoking; educational level of parents [7,8].

According to other researchers, the value of occupational hazards as a risk factor in women has decreased, and SARS during the first trimester of pregnancy, high blood pressure and smoking during pregnancy are significant [9].

Risk factors for congenital heart disease also include: mother's age over 35 years, toxicosis in the 1st trimester, ionizing radiation, the presence of other children in the family with congenital malformations [10]. The unfavorable ecological situation of the region plays a large role in the development of defects. In connection with the foregoing goal of our study was risk factors for the development of congenital heart defects in children.

## 2. MATERIALS AND METHODS

An analytical review of medical documentation and 162 case histories of children with congenital heart diseases who were treated in the cardiac surgery department of the TashPMI clinic. Control group 102 children without pathology of the cardiovascular system.

## 3. RESULTS AND DISCUSSION

Of the more than 90 types of defects available and about 200 of their various combinations, about half are defects with enrichment of the pulmonary circulation. The congenital heart defects in the observed children are: interventricular septal defect - 30.7%, atrial septal defect - 18.2%, open ductus arteriosus - 11.5%, combined malformations - 5.6%, complex malformations - 3.2% Pulmonary stenosis 3.2%, tetralogy of Fallot 2.9%, coarctation of the aorta 2%, malformations of the aortic valve 1.8%, transposition of the great vessels 0.4% (Fig. 1).

In terms of age, the children were as follows: up to 1-year-old - 122 children (10%), 1-3 years old - 322 (28%), 4-6 years old - 330 children (28%), 7-14 years old - 336 children (29%), 15-18 years old - 60 children (5%). It should be noted that in recent years there has been a significant increase in patients with congenital heart defects, this is truer for young children. This may be associated with an improvement in the quality of diagnosis of congenital heart defects, their early detection, but on the other hand, with the deterioration of the environmental situation in the region and the growing influence of various adverse factors on the formation of defects (occupational hazards, infections, low living standards population).

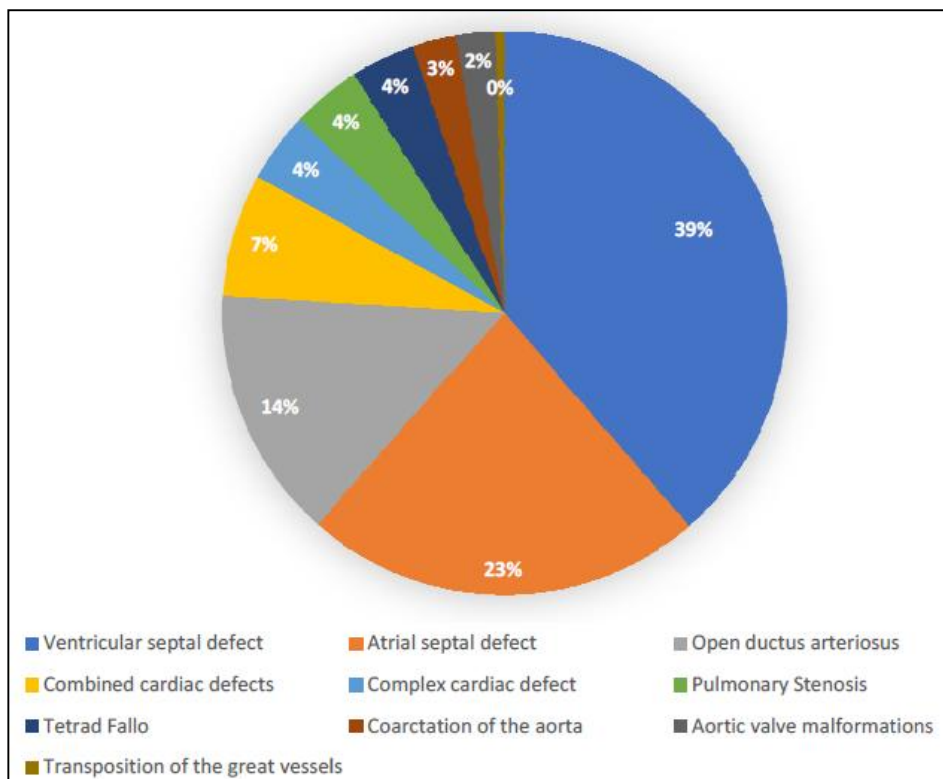
It is known that 90% of heart defects are multifactorial in nature, i.e., the combined effect of hereditary factors and environmental factors plays a role in their occurrence [11], 8% of them are caused by chromosomal abnormalities or a defect in one gene, 2% are exclusively caused by environmental factors (physical, chemical, biological). Often congenital heart defects are identified among the syndromes of chromosomal diseases (in 3.2%): with trisomy 13 - Patau syndrome and trisomy 18 - Edwards syndrome 100% of CHD are detected, with trisomy 21 - Down's syndrome in 40-50% of cases diagnosed with CHD, with Shereshevsky-Turner syndrome, congenital heart defects occur in 20% of

cases [2]. According to the cardiac surgery department, one fifth of children with congenital heart defects have hereditary syndromes [10,11].

So, in the register of congenital heart diseases there are 23 children with Down syndrome and 5 children with Down-like phenotype, 2 children with Patau syndrome and 2 children with Edwards syndrome, one child with Turner syndrome, Klinefelter syndrome. In 2.6% of cases, congenital malformations (atrial septal defect, ventricular septal defect) were detected in the immediate family of children with congenital heart defects.

A detailed analysis of the obstetric and somatic history of the parents revealed the risk factors for the development of congenital heart defects in children. We noted that half of the mothers had a complicated pregnancy. In the main group, pregnancy proceeded with the threat of termination in 32.7% of cases ( $p < 0.05$ ), and in the control group in 11.7%. Toxicosis of the first half of pregnancy suffered in the main group

32.3% of pregnant women ( $p < 0.05$ ) and in the control group only 13.3%. According to our data, chronic fetoplacental insufficiency (38%) is twice as much in the main group than in the control group (18.5%). In half of the cases (48.5%) in mothers of the main group, pregnancy proceeded against the background of anemia ( $p < 0.05$ ), and in the control group only in 12.7% of cases. Acute respiratory viral infection in the main group was suffered by 32.5% of pregnant women ( $p < 0.05$ ), of which 21.3% in the first half of pregnancy and 11.2% of mothers in the second half, and only 13 in the control group. 4%. It should be noted that the earlier the fetus is affected, the more serious the pathological changes. The presence of a single viral disease is not enough for an unborn child to develop heart disease, however, subject to additional factors (the severity of the viral and bacterial diseases, the presence of a genetic predisposition to adverse reactions to the triggering effect of this factor), the viral agent may be decisive in terms of the formation of congenital heart disease in a newborn [12,13,14].



**Fig. 1. Observed congenital heart diseases in our patients**

A burdened obstetric history was observed in both groups. Previous miscarriage and abortion were observed in 21.5% of mothers of the main group and 19.4% in the control group, infertility of 4% in each group, and stillbirths in the history of 1.8% in both groups. When studying bad habits, it was found that in the main group, 5.7% of children were born to women who abuse alcohol during pregnancy and 20.8% of pregnancies occurring during nicotine intoxication, which is 4 times more likely than in the control group ( $p < 0.05$ ) and only 5.6% of mothers smoked before pregnancy or during pregnancy.

#### 4. CONCLUSION

In conclusion, it should be noted that the risk of developing congenital heart defects in many cases is due to a combination of a hereditary predisposition with multilateral pathological influence of internal and external environmental factors, the simultaneity of their exposure, as well as the duration of exposure to the damaging factor. The main directions of preventing the birth of children with congenital heart defects are the elimination of controlled risk factors for the formation of this defect, which includes the identification and timely treatment of anemia, chronic placental insufficiency, toxicosis, the prevention and treatment of acute viral infection, chronic diseases of the pregnant woman.

Pregnant women at risk of congenital heart defects of the fetus need close attention and screening, fetal echocardiography, consultation and observation by a pediatric cardiologist from the intranatal period. Carrying out preventive measures can significantly reduce the risk of having a baby with congenital heart diseases.

#### CONSENT

Written informed consent was obtained from all participants of the research for publication of this paper and any accompanying information related to this study.

#### ETHICAL APPROVAL

The ethical approval for the study was granted by the Committee of Ethical Approval for Researches under the Ministry of Health of the Republic of Uzbekistan.

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#### COMPETING INTERESTS

Author has declared that no competing interests exist.

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