

PEDIATRICS

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CHARACTERISTICS OF THE RISK FACTOR FOR CONGENITAL DISORDERS IN NEWBORNS

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Summary. In order to objectify risk factors for cardiovascular diseases in newborns the study implied the assessment of mothers' medical records, labor characteristics, gestational age of 50 newborn infants who died of congenital heart diseases and 50 healthy newborns. The authors determined that fatal outcome in infants with congenital heart diseases is 5.4 times more likely to occur in physiological pregnancy than in newborns with non-cardiac perinatal abnormalities. However, the risk of giving birth to a baby with congenital heart disease and unfavorable course increases in comorbidities, typical for pregnancy (2.6 times), acute respiratory viral infections during pregnancy (6.1 times), bacterial and / or viral infections before and during pregnancy (53 times)

Keywords: newborns, the risk of congenital heart defects

INTRODUCTION

Congenital heart disease (CHD) is the most common congenital disorder in newborns [1-3]. Critical CHD, defined as requiring surgery or catheter-based intervention in the first year of life, occurs in approximately 25 percent of those with CHD [4]. Although many newborns with critical CHD are symptomatic and identified soon after birth, others are not diagnosed until after discharge from the maternity clinic [5-8]. The risk of morbidity and mortality in infants with critical cardiac disorders increases in untimely diagnosis and therefore timely referral to a tertiary center with expertise in treating these patients is essential [9-11]. Risks associated with pregnancy in women with congenital heart disease affect both the mother and her fetus. The obstetrician and cardiologist are consequently responsible for the welfare of two patients. Reparative surgery has substantially increased the number of females with congenital heart diseases who reach childbearing age.

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Successful operation before gestation is pivotal in reducing maternal and fetal risks. The risks of pregnancy after surgery are determined chiefly by the presence, type and degree of cardiac and vascular residua and sequelae.

The 2008 American College of Cardiology/American Heart Association guidelines for the management of adults with congenital heart disease and the 2011 European Society of Cardiology guidelines for management of cardiovascular disease during pregnancy included pregnancy recommendations for various congenital disorders [12, 13]. Women with congenital heart diseases are advised to consult a specialist in congenital heart disease in adults before becoming pregnant. The management plan should include labor and postpartum period. In women with congenital heart diseases, the risks of pregnancy to mother and fetus are related to the severity of the heart disease. The risks and predictors for maternal or fetal complications in women with congenital heart disease during pregnancy are as follows: pulmonary hypertension (pulmonary vascular disease), maternal cyanosis, low maternal functional class, history of arrhythmia, maternal anticoagulants [14-16].

2 PURPOSES, SUBJECTS AND METHODS:

2.1 Purpose

The purpose of the study - to objectify risk factors of cardiovascular abnormalities in newborns

2.2 Subjects

Children who were born in the Regional Perinatal Center, Municipal Health Protection Institution "Regional Clinical Hospital - Accident and Emergency Medicine Center" during the second half of 2013 and the first half of 2014 requiring intensive care.

The main group (the first group) was selected excluding children with genetic syndromes and congenital heart diseases due to mother's diabetes, excluding congenital heart diseases at post-mortem examination (Fig.1).

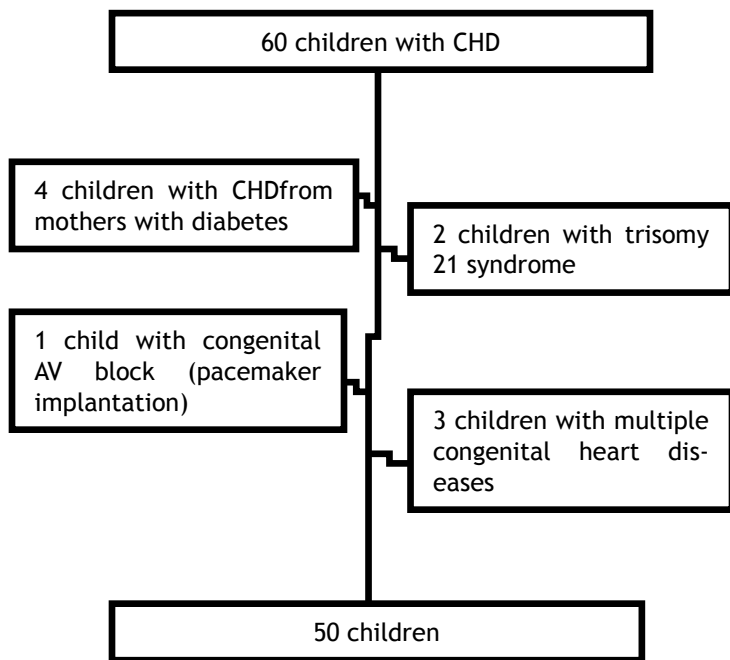


Fig.1. Schematic representation of congenital heart diseases in newborns

Control group (the second group) included 50 newborns of appropriate gestational age and body weight with perinatal abnormalities triggered by various factors.

2.3 Methods

Research design involved the study of mothers' medical records, labor characteristics, gestational age, body measurements, comorbidities and other. Clinical and

pathologic comparison was conducted for cases with fatal outcome.

3 RESULTS AND DISCUSSION

Distribution of children by sex, gestational age and body weight is given in Table 1. Thus, as can be seen from Table 1, the groups did not differ by sex, gestational age and body weight at birth and therefore are subject to evaluation.

Table 1
Main characteristics of groups under investigation, absolute (%)

Indicator	Group 1 n=50	Group 2 n=50	p
Male	29 (58)	33 (66)	0.4119
Gestational age			
>37 weeks	28 (56)	23 (46)	0.5675
35-37 weeks	12 (24)	15 (30)	0.6257
<35 weeks	10 (20)	12 (24)	0.7500
Bodyweight			
> 4000 g	2 (4)	3 (6)	0.7495
2500 - 4000 g	38 (76)	35 (70)	0.3427
<2500 g	10 (20)	12 (24)	0.7500
Days in the neonatal intensive care unit M±m	7±3.5	5±4.5	0.8046

CHD characteristics in Group 1 are presented in Table 2.

Table 2
Morphological characteristics of congenital heart diseases in newborns in groups under investigation.

Morphological characteristic of CHD	Absolute	%
Isolated ventricular septal defect (VSD)	15	30.0
Isolated atrial septal defect (ASD)	7	14.0
ASD and VSD	11	22.0
Atrial septal defect and open Botallo's duct	5	10.0
Hemodynamically relevant open Botallo's duct	4	8.0
Complex CHD (DORV, coarctation of the aorta, aorta stenosis and pulmonary artery; VSD; Pulmonary valve stenosis, VSD, ASD; Pulmonary valve stenosis, VSD)	4	8.0
Coarctation of the aorta	2	4.0
Aorta stenosis	1	2.0
Defects of aorta valve (bicuspid)	1	2.0
Total	50	100

Thus, septal defects rank a considerable proportion (66%) among other congenital heart diseases. The so-called "critical" heart diseases made up 16%.

Characteristics of pregnancy in mothers of the newborns under investigation are given in Table 3

Table 3

Main characteristics of groups under investigation
(absolute, %)

Indicator	Group 1 n=50 abs.,%	Group 2 n=50 abs.,%	P
Pregnancy failure			
Anemia	14 (28.0)	20 (40.0)	0.2083
Moderate / severe preeclampsia	3 (6.0)	5 (10.0)	0.4628
Threatened abortion / miscarriage	17 (34.0)	12 (24.0)	0.2732
Premature rupture of membranes	5 (10.0)	8 (16.0)	0.3746
Placentalabruption	4 (8.0)	8 (16.0)	0.2217
Polyhydramnios/ oligohydramnios	3 (6.0)	3 (6.0)	1.0000
Combination of pregnancy failure	15 (30.0)	7 (14.0)	0.0500
Pregnancy without features	5 (10.0)	-	0.0500
Somatic and infectious diseases			
ARVI during pregnancy	38 (76.0)	17 (34.0)	0.0001
Chickenpox	1 (2.0)	-	0.6817
Chronic pyelonephritis	3 (6.0)	4 (8.0)	0.6960
Chronic gastritis	1 (2.0)	-	0.6817
Vulvovaginitis	2 (4.0)	2 (4.0)	1.000
Hepatitis C and B	2 (4.0)	1 (2.0)	0.5591
HIV	2 (4.0)	-	0.3390
Infections (viral and bacterial) total	49 (98)	24 (48.0)	0.0001
Congenitaldiseases	2 (4.0)	-	0.3390
Hypertension > II Degree	2 (4.0)	3 (6.0)	0.6474
Obesity I and II degree	2 (4.0)	3 (6.0)	0.6474
ICP and mental disorders	3 (6.0)	-	0.1768
Somatic noninfectious abnormalities (total)	9 (18.0)	6 (12.0)	0.4029

Significant differences in medical prenatal records of women who gave birth to children with CHD and with non-cardiac perinatal abnormalities were observed only in 4 indices: combination of pregnancy failure, pregnancy without features, ARVI during pregnancy, chronic bacterial and viral infections.

Presence of possible intergroup differences in the frequency of adverse perinatal factors was used for the assessment of odds ratio for congenital heart disease risk in logistic regression models. The study implied the comparison of Group 1 children with congenital heart diseases and

Group 2 children with non-cardiac perinatal abnormalities. Calculations of risk factors for congenital heart diseases are given in Table. 4.

Table 4

Odds ratio for perinatal adverse factors in newborns
with congenital heart diseases

Sign	Basic data				Odds ratio (OR)	ln	SE	95% CI
	a	b	c	d				
Combination of pregnancy failure	15	35	74	43	2.6	0.96	0.51	0.94-7.31
Pregnancy without features	5	45	19	49	5.4	1.69	1.11	0.58-50.6
ARVI during pregnancy with fever	38	12	17	33	6.1	1.81	0.44	2.,53-14.9
Bacterial and viral infectious diseases	49	18	24	26	53.1	3.97	1.04	6.5-432.7

Note. a - Group 1 children with signs; b - Group 1 children without signs; c - Group 2 children with signs; d - Group 2 children without signs; OR- odds ratio; (ln) Napierian logarithm of odds ratio; SE - statistical error of ln; CI - confidence interval from 95% probability.

The obtained data coincide with the data published in the systematic review and the purpose of the analysis conducted for the first time was to prove that maternal fever of any nature in pregnancy triggers the development of congenital heart diseases. The study has not yet determined the impact of fever mechanisms in the development of certain types of congenital heart diseases. [17]

4 CONCLUSION

1. Assessment of medical records of mothers who gave birth to children with congenital heart diseases in comparison with non-cardiac perinatal abnormalities showed the following risk factors: combination of pregnancy failure (by 2,6 times); ARVI during pregnancy (by 6,1 times); infectious bacterial and/or viral diseases before and during pregnancy (by 53 times).
2. Congenital heart disease is 5.4 times more likely to occur in physiological pregnancy than in pregnancy with non-cardiac perinatal abnormalities.

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РЕЗЮМЕ

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ХАРАКТЕРИСТИКА ФАКТОРІВ РИЗИКУ ДЛЯ РОЗВИТКУ ВРОДЖЕНИХ ВАД СЕРЦЯ

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З метою об'єктивізації факторів ризику виникнення серцево-судинної патології у новонароджених визначено анамнез матері, особливості пологів, гестаційний вік у 50 новонароджених дітей, які померли від вроджених вад серця та у 50 здорових новонароджених. Авторами визначено, що народження дітей з вродженими вадами серця, які мають критичний перебіг, у 5,4 разів частіше відбувається при нормальному перебігу вагітності ніж народження дітей з перинатальною патологією некардіального характеру. Але ризик народити дитину з вродженими вадами серця та несприятливим перебігом підвищується якщо у жінок є сполучення патологічних станів, характерних для вагітності (у 2,6 разів); ГРВІ під час вагітності (у 6,1 разів); наявність інфекційних бактеріальних та/або вірусних захворювань до та під час вагітності (у 53 рази).

Ключові слова: новонароджені, ризик вроджених вад серця

РЕЗЮМЕ

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ХАРАКТЕРИСТИКА ФАКТОРОВ РИСКА ДЛЯ РАЗВИТИЯ ВРОЖДЕННЫХ ПОРОКОВ СЕРДЦА

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С целью объективизации факторов риска возникновения сердечно-сосудистой патологии у новорожденных изучен анамнез матери, особенности родов, гестационный возраст у 50 новорожденных детей, умерших от врожденных пороков сердца и у 50 здоровых новорожденных. Авторами установлено, что рождение детей с врожденными пороками сердца, которые имеют крити-

ческий исход, в 5,4 раза чаще происходит при нормальном течении беременности, чем рождение детей с перинатальной патологией некардиального характера. Но риск родить ребенка с врожденными пороками сердца и неблагоприятным течением повышается, если у женщин имеет место сочетание патологических состояний, характерных для беременности (в 2,6 раз), ОРВИ во время беременности (в 6,1 раз), наличие инфекционных бактериальных и /или вирусных заболеваний до и во время беременности (в 53 раза).

Ключевые слова: новорожденные, риск врожденных пороков сердца