Original Research

Epidemiological and nosological structure of patients with chronic heart failure according to institutions of tertiary level of healthcare of the Kyrgyz Republic

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Abstract

Objective: To define epidemiological and nosological structure of patients with chronic heart failure (CHF) according to hospitals of tertiary level of the Kyrgyz Republic (National Center of Cardiology and Therapy and Scientific Research Institute of Heart Surgery and Organs Transplantation).

Methods: Overall, 25415 patients medical records, patients of all ages provided treatment in the period of 2017 - 2018 in hospitals of tertiary level of the city of Bishkek were studied and analyzed. We also retrospectively studied cases with CHF referred to SRIHSOT outpatients department from city of Bishkek, observed from 2005 to 2018. In total, we included 3420 outpatient cards in the analysis.

Results: According to National Center of Cardiology and Therapy, patients with NYHA FC I-II - 57.18% (14533) prevail and in this category, female persons - 57.60% prevail. The basic etiological reason of development of CHF in adult patients with FC – I-II is coronary heart disease in 33.00% of cases. Arterial hypertension, which occurred in 5624 patients (24.43%), was the most frequent accompanying pathology. According to Scientific Research Institute of Heart Surgery and Organs Transplantation among the referred patients with CHF the females (1930, 56.4%) prevail and patients with CHF and preserved ejection fraction (50% and more) (2706, 79.1%) prevail.

Conclusion: Thus, in patients with CHF referred to NCCT, patients with FC I-II prevail and in this category female sex prevail. The main etiological reason of development of CHF in adult patients with FC – I-II is coronary artery disease followed by arterial hypertension. Among patients with CHF referred to SRIHSOT, female sex and CHF with preserved ejection fraction prevail. The 1st stage of CHF is registered in the majority of patients. Overall 72.4% of patients referred to SRIHSOT with CHF underwent surgery.

Key words: chronic heart failure, epidemiology, structure, diagnosis and treatment

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Introduction

Heart failure can develop as a result of various diseases, damage of a myocardium of any etiology, arrhythmia and conduction disturbances, pathology of valves, pericardium diseases, etc., being the final stage practically of all diseases of cardiovascular system (1-6).

In 1990, heart failure received definition of epidemic with steady growth (7, 8). The prevalence of chronic heart failure (CHF) in the USA exceeds 5.8 million, and around the world - more than 23 million (8). About 1-2% of adult population in the developed countries has CHF, with prevalence of risk >10% among patients aged older than 70 years (9). The risk of emergence of heart failure at the age of 55 is present in 33% of men and 28% of women (9). In addition, at present, it represents the serious problem of public healthcare related with the considerable incidence, mortality and expenses on healthcare, especially among people older than 65 years.

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According to the 2016 European recommendations on diagnosis and treatment of acute and chronic heart failure, coronary heart disease prevails as an etiological factor of CHF that corresponds to data of researches in the developed countries of North America (5-9).

According to studies the etiology of CHF is various among different regions of the world. Most of patients have in the anamnesis both the cardiovascular diseases and accompanying diseases capable to lead to CHF (9).

According to Belenkov et al. (3), basic etiological reasons of development of CHF in the Russian Federation are arterial hypertension (AH) (88% of cases) and an ischemic heart disease (59% of cases). Stable angina pectoris shows high prevalence (51.3% of cases) in CHF, while myocardial infarction prevalence is lower (13.3% of cases) that is related to low efficacy of treatment of this complication and the remaining high myocardial infarction mortality (3, 10, 11). The combination of an ischemic heart disease and AH exists in the majority of CHF population, at the same time acute myocardial infarction or acute coronary syndrome lead to development of heart failure in 15.3% (12). Increase in number of patients with valvular heart diseases (VHD) (4.3%) with prevalence of degenerative defect of the aortic valve and decrease in number of rheumatic defects are noted (1).

The majority of previous studies conducted in children described frequency and prevalence of the congenital heart diseases (CHD), but did not place emphasis on the heart failure in this category of patients (13-17). The international Society on Transplantation of Heart and Lungs defines children's heart failure as "the clinical and pathophysiological syndrome resulting from dysfunction of ventricles, volume or an overload pressure, separately or in a combination`` (16). In children, it results in characteristic signs and symptoms, such as poor growth, problems with nutrition, respiratory insufficiency, intolerance to exercise stress and fatigue, and is connected with blood circulation disturbances, neuro-hormonal and molecular disturbances (16).

In the United States, complex epidemiological studies on heart failure in pediatric population (16) were not reported. In the territory of Europe, two such studies were conducted (14, 15). In these studies, differences in the frequency of CHF in their populations were observed: one research revealed cardiovascular diseases in 10.4% including patients with congenital and acquired heart diseases, and another - cardiovascular diseases in 34%; and in CHD populations the frequency of heart failure was 6.2% and 39%, respectively (14, 15). The main etiological reasons were more dependent on age of children: so, until 1 year, there was more CHD; in children of advanced age, the reasons of development of heart failure along with CHD were disturbances of heart rhythm, cardiomyopathy, and VHD (14-17).

Cardiovascular diseases even more often are recognized as the important reason of incidence and mortality in developing countries. As the countries undergo epidemiological transition and social and economic development, the epidemiology of heart failure becomes more and more similar to a situation of countries of Western Europe and North America where coronary artery disease (CAD) is the only most common cause of heart failure (5, 10).

Callender et al (10), in his systematic review and meta-analysis analyzed 230,000 cases of CHF from 31 countries and revealed that heart failure is already the main burden for the population and health services in the countries with the low and middle level of income providing patient treatment to only 2.2% of cases (10). There are no data on carrying out studies of CHF in pediatric category of patients in developing countries.

In the territory of Kyrgyzstan, large-scale and system researches on epidemiological and nosological structure of CHF at the level of institutions of tertiary level were never conducted and basic reasons of its development are not certain.

It is probable that in line with AH, CAD and diabetes, rheumatic heart diseases, myocarditis, CHD takes not the last place in development of CHF.

The objective of our study was to define epidemiological and nosological structure of patients with CHF according to hospitals of tertiary level of Kyrgyz Republic (National Center of Cardiology and Therapy and Scientific Research Institute of Heart Surgery and Organs Transplantation).

Methods

To study structure of CHF, retrospective analysis of hospitalized patients and outpatients' data was conducted.

Overall, medical records of 25415 patients, provided treatment in the period of 2017 - 2018 in hospitals of tertiary level of the city of Bishkek were studied and analyzed: National Center of Cardiology and Therapy (NCCT) (50 beds) and Scientific Research Institute of Heart Surgery and Organ Transplantation (SRIHSOT) (13 beds). For classification of CHF in adults, classification of chronic heart failure of the New York Heart Association (NYHA), 1964 was used.

To study CHF structure among inhabitants of Bishkek referred to outpatient clinic of SRIHSOT, we carried out retrospective analysis of outpatient cards of the patients observed during period from 2005 to 2018. The analysis included 3420 outpatient cards. For the specified period of observation (2005-2018) in SRIHSOT, 2567 patients with CHD and 453 patients with VHD, 320 patients with CAD and 80 patients with the AH living in Bishkek were examined.

The following variables were included in the analysis: age, sex, NYHA class, CHF functional class, CHF etiology, CHF distribution by left ventricular ejection fraction, associated diseases, surgery interventions, and number of visits to cardiac surgeon after surgery.

We used descriptive statistics to present data, expressed in number and percentages.

Results

According to research objective in the period of 2017 - 2018 in the NCCT and SRIHSOT 25415 patients medical records were studied and analyzed (Table 1): 12736 in the year 2017 and 12679 in the year 2018.

Table 1. Distribution of hospitalized patients in hospitals of tertiary level of the city of Bishkek by year

Name of institute	2017 year	2018 year
NCCT	11540	11481
SRIHSOT	1196	1198
Total	12736	12679

Table 2. Distribution of adult patients by sex and NYHA FC I-II and FC III-IV

Functional class CHF	Sex				Total	
	Male		Female			
	absolute number	%	absolute number	%	absolute number	%
FC I – II	6162	42.40	8371	57.60	14533	100
FC III – IV	5881	54.04	5001	45.96	10882	100

CHF – chronic heart failure, FC – functional class

Patients hospitalized in hospitals of tertiary level were distributed by NYHA functional class, as follows: FC I-II - 57.18% (14533) and FC III-IV - 42.82% (10882) (Table 2). Apparently, as can be seen from Table 2, among all hospitalized patients with FC CHF I-II – 14533 prevail (57.38%), and in this category, females (57.60%) prevail. Among patients provided treatment with the III-IV FC CHF, male patients slightly prevail over female patients (54.04% vs. 45.96%).

NCCT

Age distribution of adult patients in groups of heart failure is presented in Table 3. In the CHF group with FC I-II younger age of patients prevailed. Patients of this group at the age of 18 - 60 made 66.93% of all hospitalizations. In a group with CHF FC the III-IV, largest percentage of hospitalization fell on age of 50 - 80 years – 81.54%.

It is authentically shown that mild course of CHF prevails in more younger age whereas the main hospitalizations with CHF high functional classes fall to the share of patients of advanced age.

Table 3. Age groups of adult category of patients with chronic heart failure

Age	NYHA functional class of chronic heart failure			
	I – II		III – IV	
	absolute number	%	absolute number	%
18 – 40- year	2772	21.357	391	4.007
41 – 50 -year	2200	16.950	863	8.845
51 – 60- year	3715	28.623	2578	26.424
61 – 70 -year	3139	24.185	3354	34.378
71 – 80 -year	982	7.566	2023	20.735
81 – 90 -year	162	1.248	524	5.371
more than 90 years	9	0.069	23	0.235
Total: 22735	12979	100	9756	100
*The used data of the NCCT with an exception of patients till 18 years				

The basic etiological reason of CHF development in adult patients with FC – I-II is CAD in 33.00% of cases (Table 4). In addition, frequent reasons of development of CHF became diabetes mellitus in 3.94% of patients and AH - in 3.69% of patients. Attracts attention that in more than a half of cases – 58.09% the etiological reasons of development of CHF were other reasons, not being classical, it is probable due to younger age of this category of patients.

Table 4. The basic etiological reasons of chronic heart failure in adult patients with functional class I-II

Etiology of chronic heart failure	Total		Male	Female
	absolute number	%	absolute number	%
Coronary artery disease	4405	33.00	1853	25.52
Arterial hypertension	493	3.69	245	248
Congenital heart diseases (in adults)	46	0.34	23	23
Valvular heart disease of various etiology[1]	122	0.91	27	95
Cardiomyopathy of various etiology[2]	7	0.05	4	3
Diabetes	526	3.94	275	251
Other etiological factors	7755	58.09		
Total	13348	100	3288	44.67
*The used data of the NCCT, 1- with an exception of congenital and degenerative etiology, 2- with an exception of an ischemic etiology				

The basic etiological reasons of CHF development in adult patients with FC – III-IV are shown in Table 5. In 84.99% of cases, CAD is the etiological reason. VHD (4.34%) is the second most important reason.

Table 5. The basic etiological reasons of chronic heart failure in patients with functional class III-IV

Etiology of chronic heart failure	Total		Male	Female
	absolute number	%	absolute number	absolute number
Coronary artery disease	8222	84.99	4717	3505
Arterial hypertension	162	1.67	97	65
Congenital heart diseases (in adults)	164	1.69	61	103
Valvular heart disease of various etiology[1]	420	4.34	135	285
Cardiomyopathy of various etiology[2]	85	0.88	46	39
Diabetes	22	0.23	10	12
Other etiological factors	1807	18.68	-	-
Total	9673	100	977	830

*The used data of the NCCT, 1- with an exception of a congenital and degenerative etiology, 2- with an exception of an ischemic etiology

The accompanying pathology of CHF of various functional classes occurred in 10,136 patients (44.03%). AH that was revealed in 5624 patients (24.43%), being was the most frequent accompanying CHF pathology. Also rather often finding in patients with CHF was the accompanying diabetes – in 1079 patients (4.69%) and the pathology of respiratory organs, which was found in 983 patients (4.27%). The accompanying rhythm and conduction disturbances of heart were revealed in 788 patients (3.42%).

SRIHSOT

In SRIHSOT, 3420 outpatient cards including: 2567 patients with CHD and 453 patients with VHD, 320 patients with a CAD, 80 patients with AH were analyzed.

There were 1930 (56.4%) female patients and 1490 (43.6%) male patients. Overall, 2475 (72.4%) patients underwent surgery, and 945 (27.6%) patients were not operated.

According to ejection fraction of left ventricle, patients were distributed as follows:

- heart failure with reduced ejection fraction (<40%) – 392 (11.5%) patients;
- heart failure with mid-range ejection fraction (from 40% to 49%) – 322 (9.4%) patients;
- heart failure with the preserved ejection fraction (≥50%) – 2706 (79.1%) patients.

According to stages of CHF (1), patients were distributed as follows: I stage is registered in 2118 (61.9%) patients; IIA stage - 974 (28.5%) patients; IIB stage - 275 (8.0%) patients; the III stage - 53 (1.6%) patients.

Associated with CHF diseases occurred in 875 (25.6%) patients. CHF was complicated by various rhythm and conduction disturbances: atrial fibrillation (AF) with rapid ventricular rate was observed in 6.8% of patients, AF with normal ventricular rate – 6.2% of patients, paroxysmal tachycardia - 5.1%, ventricular and supraventricular extrasystoles - 4.2, ventricular extrasystoles - 3.5%, atrial flutter - 1.2%, right bundle branch block - 5.0%, left bundle branch block - 5.2%, atrioventricular (AV) block - 7.4%, other– 3.6%.

Most often CHF was associated with respiratory diseases (chronic obstructive pulmonary disease, secondary pulmonary arterial hypertension, pneumonia) – 199 (5.8%) patients, cardiovascular diseases (cardiomyopathy, arrhythmias, myocarditis) – 415 (12.1%) patients, diseases of urinary system (chronic glomerulonephritis, chronic pyelonephritis) – 54 (1.6%) patients, digestive tract diseases (peptic ulcer, cholelithiasis, chronic viral hepatitis) – 13 (0.4%), endocrine diseases (diabetes mellitus type 1 and 2, thyroiditis) – 81 (2.4%) patients, other diseases (iron deficiency anemia, rheumatoid arthritis, encephalopathy, neurological disorders) – 113 (3.3%) patients.

Among patients with CHD, there were 1428 (55.6%) female patients and 1139 (44.4%) male patients. Patients were distributed by age periods according to Gundobin NP (1982) as following: 1) newborn – 5 (0.2%) patients; 2) infant (about one year) – 28 (1.1%) patients; 3) kindergarten age (from 1 to 3 years) – 86 (3.4%) patients; 4) preschool (from 3 to 7 years) – 195 (7.6%) patients; 5) school age: junior (from 7 to 10 years) – 337 (13.1%) patients; 6) school age: middle (from 11 to 14 years) – 488 (19.1%) patients; 7) school age: senior (from 14 to 18 years) – 402 (15.7%) patients; 8) youth age (from 18 to 22 years) – 109 (4.2%) patients, 9) adult (from 22 to 60 years) – 917 (35.7%) patients. Apparently, among studied population, patients of school age (47.9%) prevail.

Structural distribution of CHD across Bishkek referred to SRIHSOT is provided in Table 6. The most widespread CHD, among patients who seek surgical aid, were atrial septal defect (ASD) (23.1%), isolated ventricular septal defect (VSD) (19.4), patent foramen ovale (PFO) (16.9%), and patent ductus arteriosus (PDA) (9.5%); other types of CHD were detected slightly less often.

As it is provided in Table 6, among referred to SRIHSOT patients, occurrence of pulmonary vein stenosis (4.6%) and tetralogy of Fallot (3.8%) attracted attention. Defects with more than 1.0% of frequency were represented by combined anomalies of septal defects (3.4%), ASD with ductus arteriosus (DA) (1.7%), VSD with PDA (1.3%), VSD with pulmonary vein stenosis (PVS) (0.7%), and AV septal defect (1.0%).

Table 6. Structure of CHD referrals to SRIHSOT for period 2005-2018 years

№	Types of defects	Bishkek (n=2567)	
		absolute number	%
1.	VSD	497	19.4
2.	VSD + PDA	33	1.3
3.	VSD + PVS	18	0.7
4.	ASD	592	23.1
5.	PFO	433	16.9
6.	ASD + DA	44	1.7
7.	ASD + VSD + DA	16	0.6
8.	ASD + PVS	22	0.8
9.	ASD + anomalous pulmonary venous connection	10	0.4
10.	ASD + VSD	88	3.4
11.	PDA	245	9.5
12.	Aortic stenosis	18	0.7
13.	PVS	119	4.6
14.	Coarctation of the aorta	15	0.6
15.	Tetralogy of Fallot	98	3.8
16.	Transposition of the great vessels	13	0.5
17.	Truncus arteriosus	10	0.4
18.	AVSD	26	1.0
19.	L-transposition of the great arteries	14	0.5
20.	Anomalous pulmonary venous connection	10	0.4
21.	Ebstein's anomaly	12	0.5
22.	Other CHD	235	9.2
	Total defects	2567	100

ASD- atrial septal defect, AVSD - atrioventricular septal defect, CHD- congenital heart disease, DA- ductus arteriosus, PDA- patent ductus arteriosus, PFO- patent foramen ovale, PVS - pulmonary vein stenosis, VSD - ventricular septal defect

Among not operated patients with CHD (182, 9.0% patients) pulmonary hypertension of the 1st degree was diagnosed in 83 patients (45.6%), pulmonary hypertension of the 2nd degree – in 54 patients (29.7%), pulmonary hypertension of the 3rd degree – in 45 patients (24.7%).

The degree of pulmonary hypertension was defined according to pulmonary arterial pressure levels.

Table 7. Structure of CHD among the operated patients

№	Types of defects	Operated patients	
		absolute number	(%)
1.	VSD	113	20.8
2.	VSD + PDA	11	2.0
3.	VSD + PVS	3	0.6
4.	ASD	159	29.2
5.	ASD +PDA	6	1.1
6.	AVSD +cyanosis	2	0.4
7.	ASD + VSD + PVS	5	0.9
8.	VSD +ASD+PDA	6	1.1
9.	ASD + PVS	1	0.2
10.	ASD + anomalous pulmonary venous connection	1	0.2
11.	ASD + VSD	18	3.3
12.	PDA	143	26.3
13.	PDA + PVS	2	0.4
14.	Tetralogy of Fallot	44	8.1
15.	AVSD	9	1.7
16.	PVS	13	2.4
17.	Anomalous pulmonary venous connection	1	0.2
18.	Other CHD	7	1.3
	Total defects	554	100

ASD- atrial septal defect, AVSD - atrioventricular septal defect, CHD- congenital heart disease, PDA- patent ductus arteriosus, PVS - pulmonary vein stenosis, VSD - ventricular septal defect

In total, 539 (97.3%) radical operations and 15 (2.7%) palliative operations with application of an anastomosis were carried out. The isolated VSD was operated in 113 (20.8%) patients. In 39 (34.5%) patients, it was combined with other CHD (Table 7). Separately, ASD is operated in 159 (29.2%) patients. In 37 (23.3%) patients, its combination with CHD is noted. PDA was operated in 143 (26.3%) patients, including in 19 (13.3%) patients in combination with other CHD.

After establishment of the diagnosis of the patient with CHD, regular observation by cardiac surgeon in consulting and diagnostic office of SRIHSOT, depending on the general condition of patients, degree of pulmonary hypertension, compensation of defect in 3, 6, 9 months, 1, 1.5, 2 years was recommended. However, 1386 patients (53.9%) visited the cardiac surgeon only one time. Other patients (1182 (46.1%)) were observed by cardiac surgeon in specialized institution much more often.

In 6 (1.1%) patients in the remote period after expeditious treatment, there was a lethal outcome, in connection with the religious reasons relatives of all patients refused section, there was no opportunity to find out causes of death, and because of their absence on survey, they were not included in the observed group.

Frequency of visits to the doctor among the observed patients (n=2567) was distributed as follows: during 1st year 1643 (64.0%) of patients visited cardiac surgeon, during 2nd -3rd – 455 (17.7%), during 4-5th – 186 (7.2%), during 6-7th – 113 (4.4%), during 8-9th – 61 (2.4%), during 10th and more– 107 (4.3%) patients.

Among patients who visited the cardiac surgeon only 1 time – there were 1386 patients (53.9%), twice – 343 (13.4%) patients, three times – 274 (10.7%) patients, 4 times– 194 (7.6%) patients, 5 times – 124 (4.8%) patients, 6 times – 88 (3.4%) patients, 7 times – 50 (1.9%) patients, 8 times – 28 (1.1%) patients, 9 times – 22 (0.9%) patients, 10 times – 9 (0.5%) patients, and more than 11 times - 45 (1.8%) patients.

The low commitment to dispensary observation of patients with CHD is observed. From all patients only 4.3% for 10 years and more visited the doctor and observed the ordered medical recommendations. Other patients were observed during 1 year (64.0%) or within 2-3 years (17.7%). Frequency of visits of the heart surgeon and observance of medical recommendations did not depend on a type of CHD.

Most of patients visited the doctor within 1 year after establishment of the diagnosis (53.9%) and, as a rule, once.

After surgery, the patient`s regular observation by the heart surgeon at consulting and diagnostic department SRIHSOT at 3, 6, 9 months, 1, 1.5, 2 years was recommended (Table 8). However, of 554 patients only 222 patients (40.1%) one and more times visited the cardiac surgeon after operation. Other patients (332 (59.9%)) for many years did not visit cardiac surgeon in specialized institution.

Table 8. Frequency of visits of the heart surgeon by patients with congenital heart disease after surgery

Observation periods (month, year)											
Three months		Six months		Nine months		One year		One and a half years		Two years	
Abs. number	%	Abs. number	%	Abs. number	%	Abs. number	%	Abs. number	%	Abs. number	%
Frequency of visits of the heart surgeon (n=222)											
21	6.5	38	11.8	53	16.5	103	32.0	28	8.7	79	24.5

Among patients with the acquired VHD, females comprise 302 (66.7%) patients, males – 151 (33.3%). The adult age (from 22 to 60) prevailed among most of patients – 441 patients (97.4%), there were only 12 patients of young and school age (2.6%).

Overall, 214 (47.2%) patients who are on follow-up observation at consulting and diagnostic office of SRIHSOT underwent hospital treatment.

Because of a chronic rheumatic fever, the acquired VHD arose in most of patients – 368 (81.2%); there were also 8 (1.8%) patients with primary infectious endocarditis and 19 (4.2%) patients with secondary infective endocarditis. Other reasons of VHD (atherosclerosis, heart injuries, syphilis, etc.) were registered in 58 (12.8%) patients.

By the number of the affected valves, combined VHD prevailed in most of patients (355 (78.4%)), isolated or local were seen less often (35 (7.7%)). By the form the affected valve, the following forms were allocated: aortic (207), mitral (297), tricuspid (196), pulmonary (4).

According to hemodynamics, patients were distributed as following: compensated VHD was recorded in 171 (37.7%), subcompensated – 221 (48.8%), and decompensated – 61 (13.5%).

In total, 140 patients (30.9%) were operated. Closed mitral commissurotomy was performed in 15 (3.3%) cases, mitral valve replacement - in 77 (16.9%) patients, mitral and aortic valve replacements - in 20 (4.4%) patients, mitral, aortic and tricuspid valves replacements were carried out in 4 (0.9%) patients, mitral and tricuspid valves replacements - in 18 (3.9%) of patients, aortic valve replacement - in 1 (0.2%) patient, and tricuspid valve replacement - in 1 (0.2%) patient.

Conclusions

According to NCCT data in patients with CHF, patients with FC I-II prevail and in this category female sex prevail. The basic etiological reason of development of CHF in adult patients with FC – I-II is coronary artery disease (33.0% of cases). Arterial hypertension, which occurred 24.43%, was the most frequent accompanying pathology.

According to SRIHSOT among patients with CHF, female sex and heart failure with preserved ejection fraction prevail. The stage I of CHF is registered in the majority of patients. Overall 72.4% of patients referred to SRIHSOT with CHF underwent surgery. The most widespread CHD, mainly prevailing among the patients who seek the surgical aid, were secondary type of ASD, isolated VSD, PFO and PDA. Operations in patients with CHD were mainly performed for correction of secondary type ASD (29.2%), PDA (26.3%), and VSD (20.8%). There was a low compliance to dispensary observation of patients with CHD. Only 4.3% of patients for 10 years and more visited the doctor and observed the ordered medical recommendations. Most of patients visited the doctor within 1 year after establishment of the diagnosis and, as a rule, once. Chronic rheumatic heart disease was diagnosed in most of patients – in 81.2% it was the reason for VHD. Patients with combined VHD prevailed. Only 30.9% of patients are operated that does not reflect the necessary volume of the help, which this category of patients' needs.

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