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Original Article

Cardiovascular Diseases in Dialysis Patients at Different Levels of Healthcare of the Republic of Uzbekistan

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Abstract:

Background: Despite the fact that the prevalence of CKD and its effects on health have been studied mainly in economically developed countries, the burden of this disease is even greater in developing countries. It has been established that more than 50% of deaths in patients with ESRD are due to cardiovascular causes. The objective of our study is to comparatively study the structure of cardiovascular diseases in dialysis patients at different levels of health care in Uzbekistan.

Methods: 165 dialysis patients (90 men and 75 women) were studied. The main initial diseases were chronic glomerulonephritis (n=76), diabetes mellitus (n=44), urolithiasis (n=14), chronic pyelonephritis (n=10), etc. Patients were included from 3 clinics of different administrative levels - republican (n=32), urban (n=72) and rural (n=61).

Results: CVDs were identified in 69% of the urban, 44% of the regional and 47% of the republican population. In the structure of CVD, AH, IHD and CHF prevailed in all groups. Also, in the groups of the republican and city level, CVD was more common in a combined form, while dialysis patients at the regional level had more isolated CVD pathology.

Conclusion: Patients of the urban population on dialysis more often suffer from CVD than patients receiving HD at the republican and regional levels of health care. The combined lesion of the CVS occupies a leading place in the structure of CVD in dialysis patients at both urban and national levels.

Keywords: Cardiovascular Diseases; CKD; Hemodialysis; Hypertension; Coronary Heart Disease; Heart Failure

Introduction

Globally, the total number of people with chronic kidney disease (CKD), acute kidney injury (AKI) and those receiving renal replacement therapy (RRT) exceeds 850 million, which is indeed twice the estimated number of people with diabetes worldwide and 20 times higher than the number of people with acquired immunodeficiency syndrome (AIDS)/human immuno-

deficiency virus (HIV) worldwide (1). According to international guidelines (2), it is recommended to consider all patients with CKD as individuals with an increased risk of developing cardiovascular diseases (CVD), with level of evidence 1A.

The guidelines of the Russian Society of Cardiology "Cardiovascular risk and chronic kidney disease: cardio-nephroprotection strategies" (2013) prescribe mandatory determination of the state of renal function by glomerular filtration rate (GFR) and/or urinary albumin excretion (3). Epidemiological studies indicate a high incidence of cardiovascular disease (CVD) in patients with (CKD) (4, 5). Thus, the prevalence of arterial hypertension (AH), as the most important risk factor for coronary heart disease (CHD) and left ventricular hypertrophy (LVH), in chronic kidney disease is 87-90%. While in the general population, the prevalence of AH is less than 40%. At least 35% of patients with renal pathology at the time of contacting a nephrologist have various manifestations of CHD in their history (myocardial infarction or angina). The presence of CHD at the start of renal replacement therapy (RRT) increases the risk of death on hemodialysis by 45%, and heart failure - by 93% (6). Most patients with CKD do not develop progressive or end-stage kidney disease (ESRD), but they have an increased risk of cardiovascular disease (CVD) (7). The risk of CVD increases inversely with the level of GFR, and at GFR <30 ml/min it exceeds that with preserved renal function by 5.5 times. A significant number of patients with CKD die due to CVC even before ESRD (8).

Studies have shown that mortality from CVD in dialysis patients is 10-20 times higher than in the general population (9). S.H. Chung et al. reported that the risk of mortality for dialysis patients with CVD was 3.3 times higher than for non-smoking dialysis patients without CVD (10). In the study of J. Tong et al., mortality among dialysis patients with CVD was 2.9 times higher than that in other patients (11). There are works in the literature devoted to CVD in patients with CKD 5D, however, they are mainly devoted to the study of any one of the pathologies of the heart and blood vessels, while a comprehensive assessment of the frequency, structure and comparative assessment of CVD in dialysis patients at different levels of health care are not presented (12, 13).

Despite the fact that the prevalence of CKD and its impact on health have been studied mainly in economically developed countries, the burden of this disease is even greater in developing countries (14), which show the relevance of studying this problem in our country.

The purpose of this work is to comparatively study the structure of cardiovascular diseases in patients with terminal CKD receiving program hemodialysis at different levels of health care in the Republic of Uzbekistan.

Methods

Participant Selection: A total of 165 patients (90 men and 75 women) with stage 5 CKD undergoing program hemodialysis were examined. The study included patients with a clinically established diagnosis of stage 5 CKD as a result of nephropathies of various origins. GFR was calculated based on serum creatinine concentration using the CKD-Epi formula. The main underlying diseases were chronic glomerulonephritis (n=76), diabetes mellitus (n=44), urolithiasis (n=14), chronic pyelonephritis (n=10), etc. The duration of HD was 29 (6-89) months. Programmed hemodialysis was performed using Fresenius Medical Care 4008S devices, WEGO F15 LW and Diacap Polysulfone LOPS18 LW dialyzers. Hemodialysis sessions were performed according to the scheme of 4 hours 3 times a week (12 hours/week) according to international recommendations. Bicarbonate solution was used as a dialysate for hemodialysis. Kt/V indicators corresponded to the minimum target level of 1.4. The criteria for exclusion from the study were age under 18 years, patients who underwent kidney transplantation, patients receiving HD for acute renal failure (Figure 1).

Study Design: This study is an original prospective cohort study. The study was performed in accordance with the standards of Good Clinical Practice and the principles of the Declaration of Helsinki. The study protocol was approved by the Ethics Committees of all participating clinical centers. Written informed consent was obtained from all participants before inclusion in the study.

In order for the study to represent the entire spectrum of patients from hospitals of different administrative levels, the cohorts included all patients from each of the three hospitals who were on program hemodialysis at the time of the initial examination. Patients were included from 3 clinics of different administrative levels - republican (n = 32), city (n = 72) and rural (n = 61). The studies were conducted at the Republican Specialized Scientific and Practical Medical Center of Urology (republican level), the City Nephrology Hospital of

Tashkent (city level) and the Syrdarya Regional Multidisciplinary Medical Center of Gulistan (rural level).

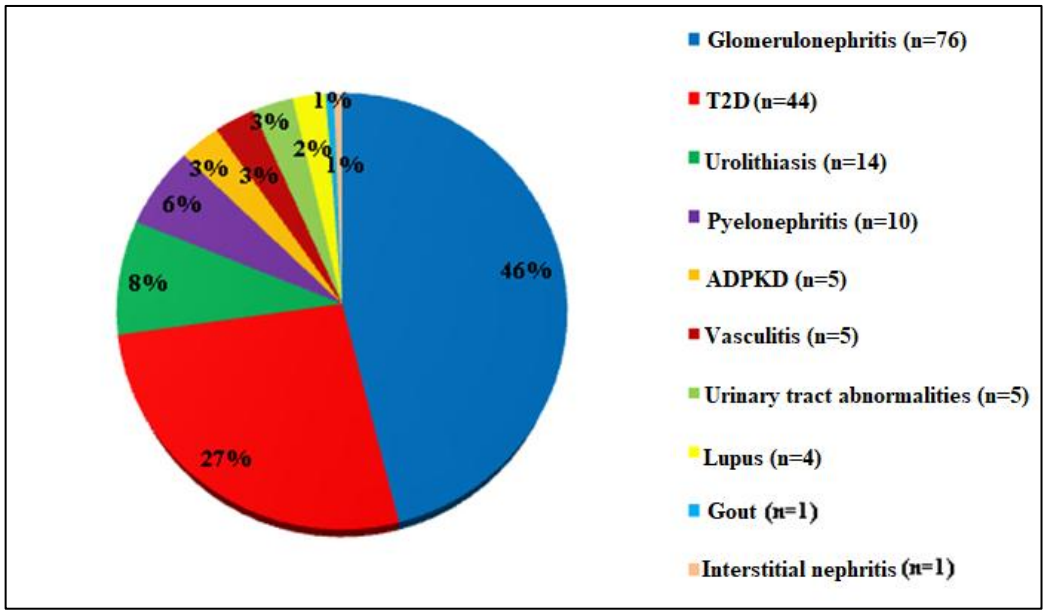

Figure 1. Etiology of CKD 5D in the studied patients (n=165).

The distribution of patients by gender and age in the groups who took part in the study is shown in Table 1. As can be seen from the table, if in general there was no clear predominance of male patients (54.5% (n=90) of all those examined were men, 45.5% (n=75) were women), then in the rural group there was an almost twofold excess of men over women: 39 (64%) and 22 (36%) patients, respectively.

Table 1. Distribution of patients with CKD 5D by sex and age (M±m).

Indicator	Republican level	City level	Rural level	All patients
All patients, %	32 (19 %)	72 (44 %)	61 (37 %)	165 (100 %)
Men, %	16 (50 %)	35 (49 %)	39 (64 %)	90 (54,5 %)
Women, %	16 (50 %)	37 (51 %)	22 (36 %)	75 (45,5 %)
Average age, years	51,2±2,65	49±1,62	45,5±1,83	48,1±1,11
Average age of men, years	48,8±3,68	48,1±2,3	44,6±2,30	46,7±1,49
Average age of women, years	53,6±3,83	49,9±2,29	47,1±3,06	49,9±1,66

The age of the patients ranged from 18 to 78 years. The average age was 48.13±1.11. The patients at the republican level were aged from 27 to 78 and had an average age of 51.2±2.65 years. The patients at the urban level were younger, their average age was from 18 to 78 and was 49.0±1.62 years. The rural group of patients was the youngest, from 18 to 69. Their average age was 45.5±1.83 years.

Data Collection & Variables: All patients underwent laboratory and instrumental examination upon inclusion in the study, including general blood and urine tests, biochemical blood tests (total protein, azotemia

indicators), electrocardiography, ultrasound examination of the kidneys, echocardiography (Table 2).

Table 2. Main indicators of dialysis patients at different levels of health care (M±m).

Parameters		Republican level	City level	Rural level
Sex	men(%)	16 (50 %)	39 (64 %)	35 (49 %)
	women(%)	16 (50 %)	22 (36 %)	37 (51 %)
Average age, years		51,2±2,65	45,50±1,83	49,00±1,62
Average duration of HD, months		58,40±12,28**	16,60±2,40†	27,40±3,79§§
SBP, mmHg		133,90±4,71	140,90±2,47	148,60±3,09§
DBP, mmHg		84,30±2,44	89,20±1,50	86,80±1,54
HR, bpm		80,80±0,95	80,90±0,94	80,40±1,13
Total blood protein, g/l		70,70±1,10***	62,90±0,87†††	65,70±0,93§
Hemoglobin, g/l		92,10±3,78***	73,30±2,19	85,80±2,30§§§
Erythrocytes, *1012/l		3,00±0,13*	2,70±0,06	2,8±0,70
Blood urea, mmol/l		25,00±2,88*	18,00±1,10	23,80±0,89§§§
Blood creatinine, µmol/l		637,20±44,03	604,40±40,44	705,00±28,27§
GFR (according to CKD-Epi), ml/min		8,8±0,88	11,5±1,34	7,6±0,58§§

*Note: the reliability of the difference is indicated by symbols: between the groups Republic and Region - *, Republic and City - ^, Region and City - Δ(for */†/§, p<0.05, for **/††/§§, p<0.01, for ***/†††/§§§ p<0.005).*

Statistical Analysis: Statistical data processing was performed using the standard Statistica for Windows package, version 6.0. The Mann–Whitney test was used to compare two independent groups, the Kruskal–Wallis test was used to compare more than two independent groups, and the Spearman test was used for correlation analysis. Multiple linear regression analysis was also performed. Differences were considered reliable at $p<0.05$.

Ethical Considerations: Example: "All participants provided written informed consent.

Results

According to our study, the structure and frequency of CVD differed in patients of the 3 groups both in structure and frequency (Table 3).

When examining the data obtained, the indicators of the rural and republican levels are noteworthy. In these groups, the frequency of cardiovascular diseases did not differ significantly from each other and amounted to 44% and 47%, respectively. At the same time, at the urban level, the frequency of CVD at the start of the survey was 1.5 times higher than both the rural and republican levels, amounting to 69% (Figure 2).

Table 3. The structure and frequency of cardiovascular diseases in patients with CKD 5D.

Parameters	Republican level (n=32)	City level (n=72)	Rural level (n=61)
Total patients with CVD	15 (47 %)*	50 (69 %)†††	27 (44 %)
Total patients with AG	15 (47 %)	45 (62,5 %)††	24 (39 %)
Total patients with CHD	3 (9 %)***	39 (54 %)†††	5 (8 %)
Total patients with CHF	1 (3 %)***	19 (26 %)†††	3 (5 %)
Total patients with arrhythmia	-	5 (7 %)	3 (5 %)
Including:			
with AG + CHD	2 (6 %)***	24 (33 %)†††	2 (3 %)
with AG + CHF	-	3 (4 %)	1 (2 %)
with CHD + Arrhythmia	-	2 (3 %)	1 (2 %)
with AG + CHD + CHF	1 (3 %)	10 (14 %)†	1 (2 %)
with AG + CHF + Arrhythmia	-	-	1 (2 %)
with AG+CHD+CHF+Arrhythmia	-	3 (4 %)	-

*Note: the reliability of the difference is indicated by symbols: between the groups Republic and Region - *, Republic and City - †, Region and City - § (for */^/§, p<0.05, for **/^^/§§, p<0.01, for ***/^^^/§§§ p<0.005).*

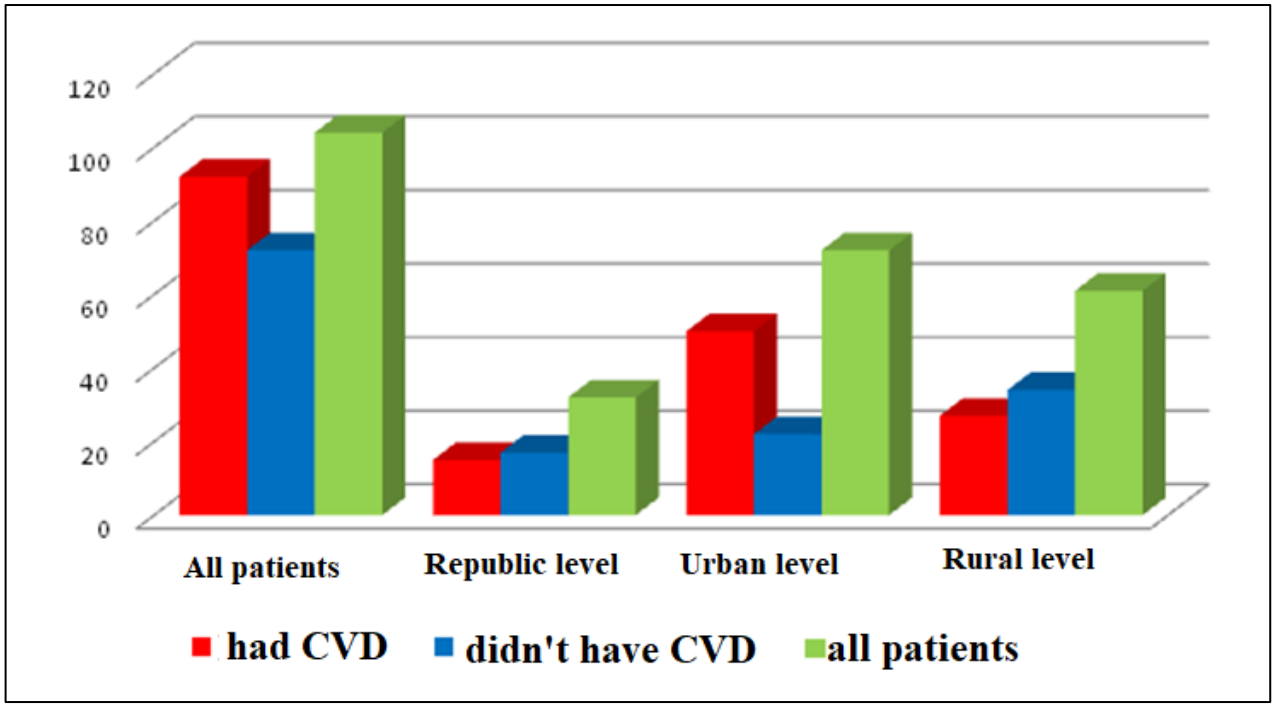

Figure 2. The ratio of patients with CVD and without CVD in groups.

Depending on gender, the incidence rates of CVD in all groups did not differ significantly (Figure 3).

We examined the frequency of CVD separately in each group of patients. At the same time, a number of features were revealed, which is associated with the status of the medical institution.

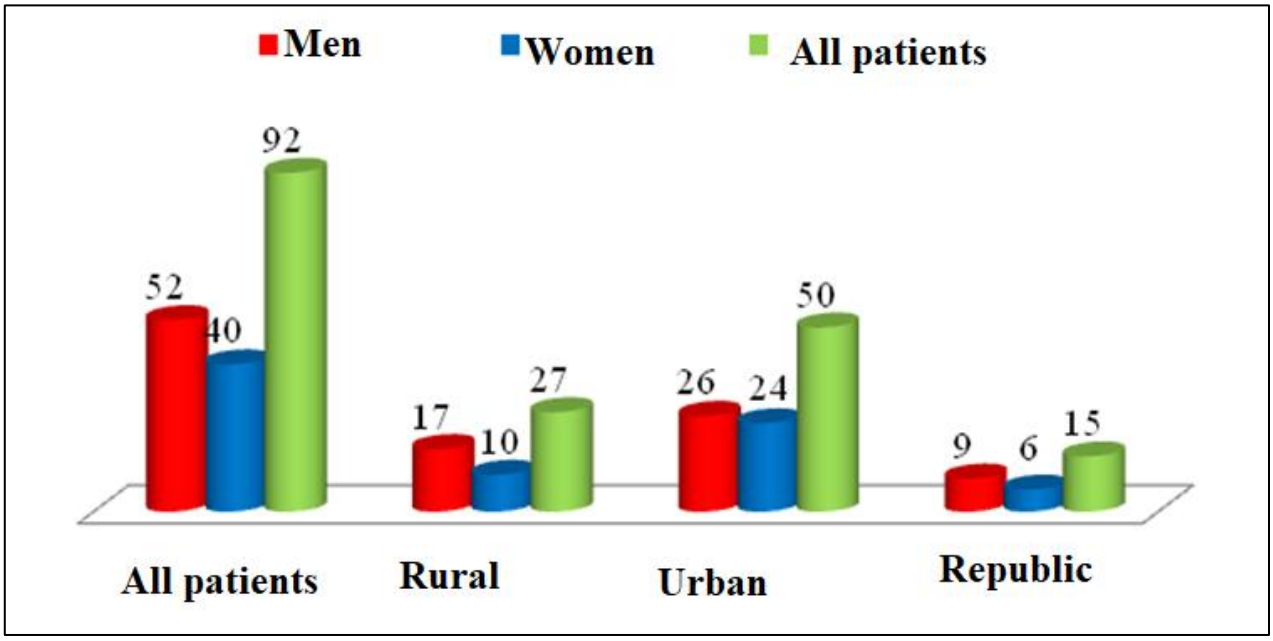

Figure 3. Sex ratio of patients with CVD.

In the urological center (republican level), 47% of patients were diagnosed with some CVD. At the same time, all examined patients (n=15) were found to have hypertension, both isolated and in combination with other CVD diseases. The majority (n=12) of patients had isolated hypertension. In 3 patients, hypertension was combined with coronary heart disease, and in 1 case, with the development of heart failure with combined hypertension + coronary heart disease (Figure 4). A feature of this group of patients was the absence of patients with coronary heart disease and arrhythmia.

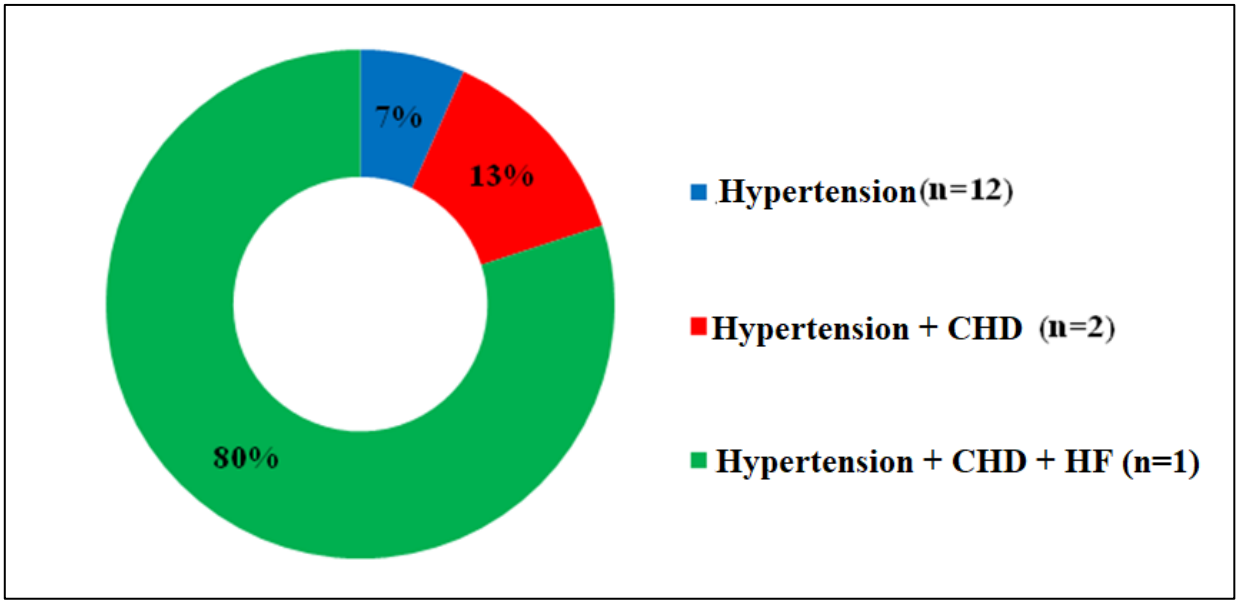

Figure 4. The structure of cardiovascular diseases in dialysis patients at the republican level (n=32).

At the city level, CVD was detected in 50 patients (69%). Here, the most common CVD was hypertension, it was found in 62.5% (n=45) of all patients. At the same time, this group also had a significant frequency of patients with coronary heart disease (54.2%, n=39) and CHF (26.4%, n=19). The most common combination of CVD was hypertension + coronary heart disease. It was found in almost half (n=24) of patients with CVD in the city. A feature of this group of patients was the high frequency of combined cardiovascular diseases as a complication of hypertension and coronary heart disease - 59.7% (n=43) in various combinations (Figure 5).

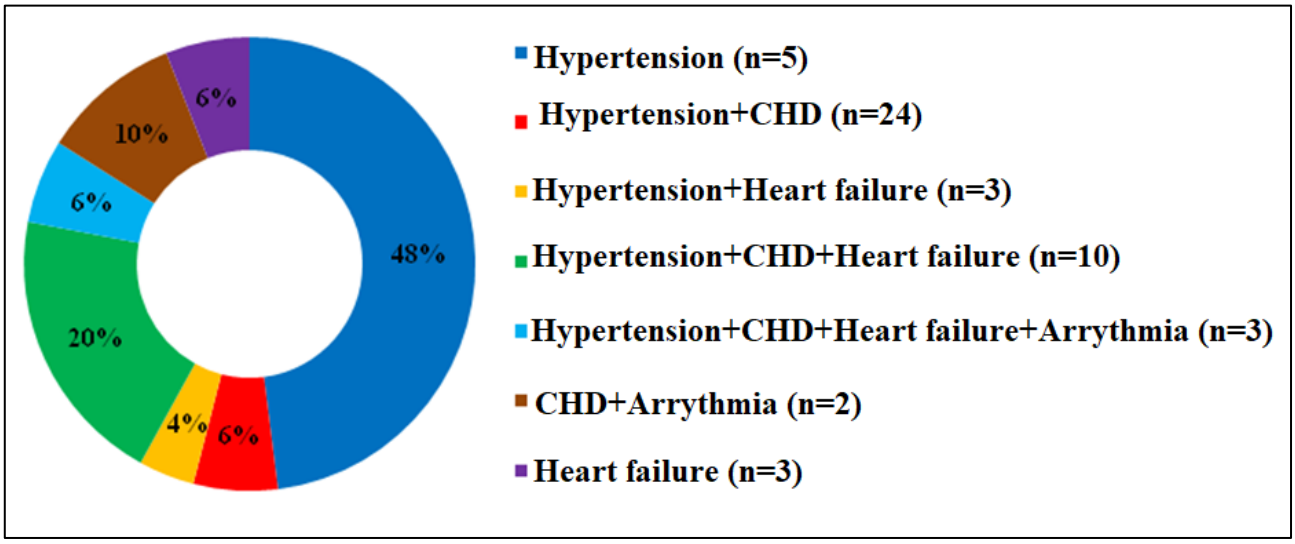

Figure 5. Structure of cardiovascular diseases in dialysis patients at the city level (n=72).

Another feature of this group of patients was the high frequency of diabetes. In 50 patients with CVD, diabetes was diagnosed in 48% (n=24) of cases. It should also be noted that anemia was highly prevalent in this group of patients - it was found in 47 (94%) patients with CVD. These data indicate not only the actual frequency and structure of comorbid conditions in patients with CKD 5D in the urban population, but also their better detection in this institution. At the rural level, CVD was detected in 44.2% (n=27) of patients. We have already mentioned two reasons for such a low detection rate of CVD. As in other institutions, hypertension was the most common CVD pathology in patients on HD - 39% (n=24) of all patients. This amounted to 89% of all CVD in this group. The frequency of coronary heart disease (n=5), CHF (n=3) and cardiac arrhythmia (n=3) was almost the same. The combination of CVD was also represented by isolated cases (Figure 6).

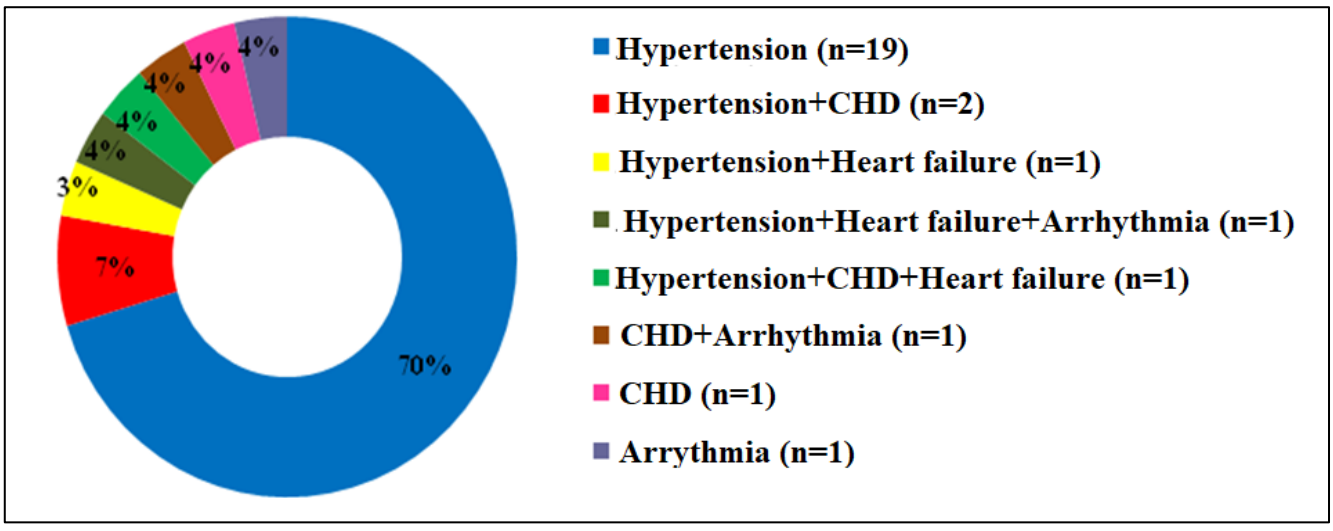

Figure 6. Structure of cardiovascular diseases in dialysis patients at the rural level (n=61).

At the rural level, 77% (n=47) of all examined patients had anemia, and in patients with CVD, anemia was found in 70% of cases (in 19 of 27 patients). 11 (41%) of 27 patients with cardiovascular diseases suffered from diabetes.

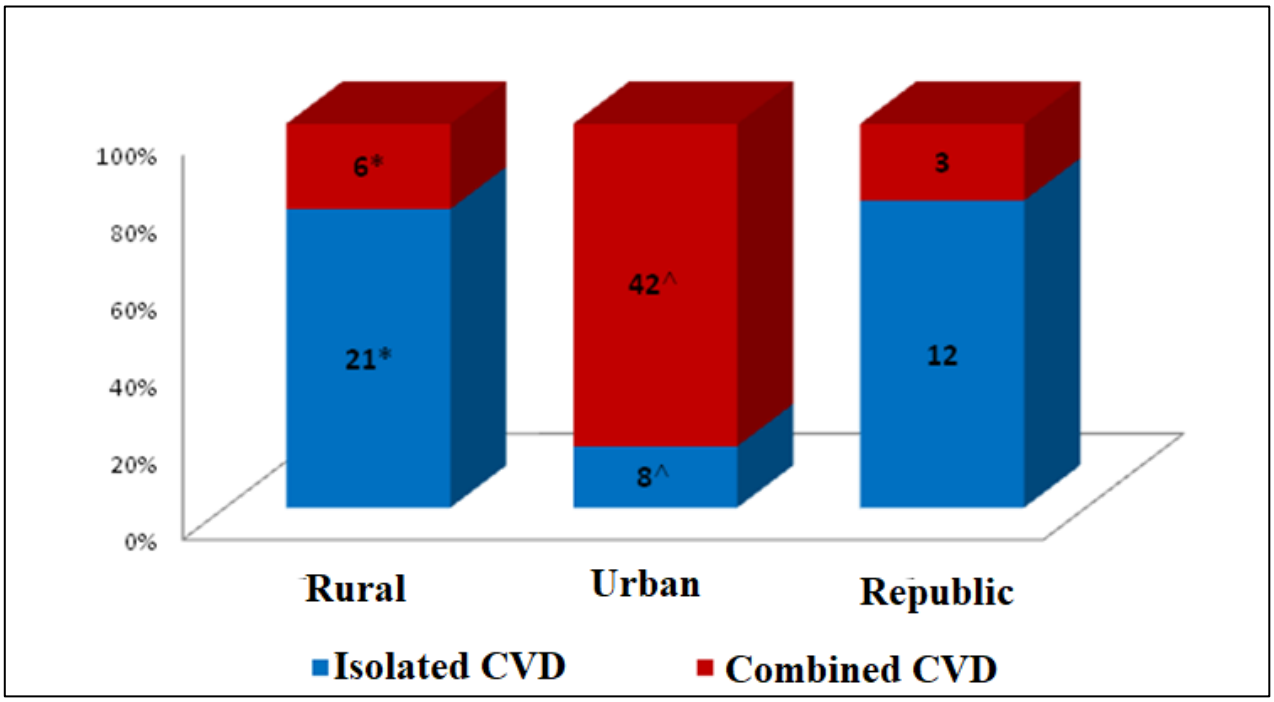

Figure 7. The ratio of patients with isolated and combined pathologies of the cardiovascular system in the study groups.

*Note: p <0.05 is indicated by symbols: between rural and urban groups - *, city and republic - ^, region and republic - Δ*

As noted above, the structure of CVD was presented both in an isolated form and in combined CVD lesions. Moreover, at the republican and rural levels, combined CVDs accounted for 20% (n=3) and 22% (n=6), respectively, while at the urban level this figure was 84% (n=42) (Figure 7). This indicates the fact that the urban contingent had a greater comorbidity in CVD, which is a risk of cardiovascular mortality in patients with CKD 5D.

Discussion

According to our study, the structure and frequency of CVD had significant differences in patients in 3 centers of different levels of healthcare in the Republic of Uzbekistan. When considering the obtained data, attention is drawn to the indicators of the rural and republican levels. In these groups, the frequency of CVD did not differ significantly between themselves (44% and 47%, respectively). At the same time, in the city, the frequency of CVD at the beginning of the survey was 1.5 times higher than the indicators of both the rural and republican levels, amounting to 69%. In our opinion, this is due to a number of objective and subjective reasons. First of all, this is due to the characteristics of the contingent applying to medical centers of different levels. In the city, mainly residents of Tashkent apply, living in conditions of high urbanization, fast pace of life, psychoemotional overload and a sedentary lifestyle, contributing to the development of CVD. Numerous studies have proven that residents of large cities are more susceptible to CVD (15, 16). At the same time, at the republican level, all patients were also residents of Tashkent, but in this group, the low frequency of CVD was associated with the specificity of a specialized urology center and a specific contingent of patients with a urological profile.

In rural population, a lower frequency of CVD is associated, on the one hand, with the fact that patients living in rural areas, less susceptible to coronary heart

disease, come here. On the other hand, patients had coronary heart disease and hypertension not diagnosed in primary health care. In addition, an analysis of diagnoses in case histories showed that patients before and during HD were given a detailed diagnosis associated with kidney pathology, while not in all cases CVD was reflected in concomitant diseases by nephrologists. They reflected easily detectable hypertension and arrhythmia in the diagnosis of this contingent of patients.

In urban patients, 69% of patients were diagnosed with CVD. Of these, the most common CVD was hypertension - 62.5%. At the same time, a significant frequency of patients with coronary heart disease (54.2%) and chronic heart failure (26.4%) was also noted in this group. A feature of this group was a high frequency of combined cardiovascular diseases - 59.7% and diabetes. In 50 patients with CVD, diabetes was diagnosed in 48% of cases. The high incidence of anemia indicates not only better detection of comorbid conditions in this institution, but also their real frequency and structure in patients with CKD 5D in the urban center.

The prevalence of combined CVD lesions shows that at the urban level there is a high comorbidity for CVD, which is a high risk of mortality in patients with CKD 5D. These data were confirmed in the analysis of mortality in patients at the urban level. It turned out to be the highest compared to the rural and republican center.

These data in practical terms force us to reconsider the strategy for managing these patients in favor of a strict system of prevention and treatment of CVD, which has significant prospects for increasing survival and further referral for kidney transplantation.

Conclusion

Dialysis patients often (in 44-69% of cases, depending on the level of healthcare) have comorbid CVD pathology. Based on the analysis of 165 dialysis patients, regardless of the level of medical care, the main CVD pathologies in patients were hypertension, coronary heart disease and CHF. According to the results of our study, patients with stage 5 CKD at the urban level suffer from CVD more often than at the republican and rural levels. Combined CVD pathology occupies a leading place in the structure of CVD in patients with stage 5 CKD at the republican and city levels of healthcare. In the gender context, the structure of CVD did not differ significantly between the groups.

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