



The Daily Profile of Blood Pressure in Patients with CKD of Various Stages

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Abstract

All patients conducted an explanation about monitoring the level of blood pressure in the form of self-control to assess its influence on the development of CKD, and also determined intrauditive and long-term variability (LTV). Due to the study, the presence of arterial hypertension is recorded as a risk factor for the progression of chronic kidney disease in the absence of clinical manifestations, the data indicate the need to study arterial hypertension as a risk factor for the development and progression of CKD during the initial examination of patients. In the early diagnosis of risk factors, normalization of the level of HTN, and the achievement of target blood pressure numbers is more effective.

Keywords: Chronic Kidney Disease; Arterial Hypertension; Primary Link; Progression; Intrauditive Variability; Long-term Variability; Prevention; Risk Factors

Relevance

Chronic kidney disease (CKD) is a general-human problem that has deep socio-economic consequences associated with its wide prevalence in the population (10-15% of the population), loss of working capacity and mortality due to the development of End-Stage Kidney Disease (ESKD) and cardiovascular complications (CVC), whose risk in patients with impaired renal function increases tenfold. The danger of CKD, as well as other "quiet killers" - diabetes mellitus (DM), hypertension, oncological diseases - consists in the fact that patients have not experienced changes in well-being for a long time, which leads to the late detection of CKD when the possibilities of nephroprotective therapy are exhausted. The role of screening centers consists, first of all, in attracting attention to the problem of HBP, to solve it, it is necessary to have constant systematic work using existing structures of the preventive medicine system. As you know, arterial hypertension is a common cause of chronic kidney disease. But many forget that HTN is also one of the risk factors for the development and progress

of CKD. In this case, the HTN stage is missed, in which it can be prevented or delayed by the development of CKD, especially in the conditions of the primary health care link. Of great importance in CKD, especially in the later stages, when the instability of blood pressure is enhanced, have 24-hour blood pressure monitoring, as well as self-control. Data of 24-hour blood pressure monitoring and regular self-measurements allow you to get a more adequate idea of the state of hemodynamics than random measurements of blood pressure by a doctor, which is important for adjusting doses of drugs, taking into account the correspondence of the level of average daily and medium blood pressure, the range of optimal values. This has been a prerequisite for our study by HTN and CKD in the conditions of primary health care.

Subjects and Methods

The study was conducted between September 2021 and May 2022. With the initial visit of the patient to the level of primary health care doctors on the basis of complaints, anamnesis of life

and disease, objective examination, data of the survey, laboratory and instrumental studies, hypotensive therapy was carried out in the presence of arterial hypertension. The criterion for exclusion from the study was the patient's refusal to participate in the study. The study included 217 patients with urinary organs, with stable forms of coronary heart disease and hypertension, endocrine diseases and diabetes aged 18 to 65 years. Patients were divided into 4 comparison groups according to the GFR category of chronic kidney disease (CKD) according to KDIGO 2012: group 1 GFR 60-89 ml/min/1.73 m² (n = 54); Group 2 GFR 45-59 ml/min/1.73m² (n = 53); group 3 GFR 30-44 ml/min/1.73m² (n = 58) and group 4 GFR 15-29 ml/min/1.73m² (n = 52). All patients were conducted an explanation about monitoring the level of blood pressure in the form of self-control to assess its influence on the development of CKD. In the process of research, patients were examined three times a year and, if necessary, in a planned manner, they turned to the reception in the clinic. Correction of arterial hypertension was carried out depending on the primary disease using various antihypertensive drugs, as well as their correction throughout the study to achieve the target level of blood pressure.

To study the level of blood pressure, it was measured using a tonometer with an indicator manometer in a sitting position after a 10-minute rest, the measurement was carried out 3 or often, which then registered with the calculation of their medium size. At the stages of the study, intrauditive variability of blood pressure (SHTN and DHTN), as well as long-term variability based on self-control of the patient at home with fixation of data, was determined. If necessary, patients were made correction of hypotensive therapy. The target level of blood pressure, the SHTN was considered <140 mm Hg, DHTN <90 mm Hg.

Study Results

At the initial stage, of all examined in 111 (51.15%) patients, HTN was found in various numbers and on average amounted to 154.5/85.78 mm Hg. At the same time, 33 (15.2%) of all examined (n = 217) patients did not even know about the presence of HTN, which already influenced the development and progression of CKD. Based on the results obtained during the monitoring of blood pressure in the cohort of patients HTN (P = 111), it was established: at the 1st stage of the study, during the initial examination, the following indicators of the SHTN and DHTN in comparison groups were noted on average: in the 1st group - 148.18 ± 2 ± 2 , 36 and

82,12 ± 0.95 mm Hg Accordingly, in the 2nd group - 152.12 ± 1.49 and 85.52 ± 1.08 mm Hg. Accordingly, in the 3rd group - 157.71 ± 1.45 and 86.97 ± 1.12 mm Hg. Accordingly, in the 4th group - 161.77 ± 1.92 and 88.52 ± 1.13 mm Hg. respectively (Figure 1). At the same time, the average indicators of systolic blood pressure (SBP) were significantly higher in the 4th group than in 1 group by 9.2% (P1-4 <0.001) and by 17.0% (P1-4 <0.001) than in group 2 per 6.3% (p2-4 = 0.001) and higher than the 1st by 9.4% (p2-4 = 0.01); At the same time, the average SBP in patients of group 3 was higher than in 1 group by 6.4% (P1-3 = 0.002). In the course of the study, a direct dependence of the degree of HTN on the CKD stage was also revealed, so at 4 stages of CKD when compared with the 2nd stage of HBP, the frequency of HTN 1 mmHg decreased by 3.1 times (P1-4 <0.01), and the frequency of HTN 3 mmHg . It increased 2.9 times (P1-4 <0.05).

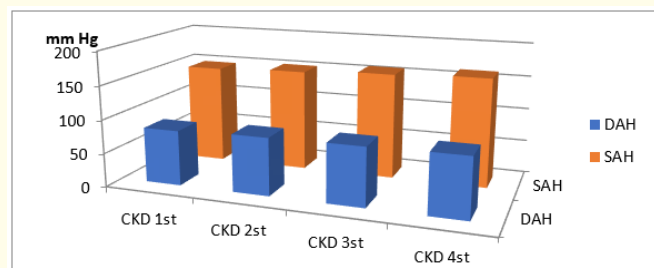


Figure 1: The prevalence of arterial hypertension by groups of patients.

Also, a reliable increase in the average values of SHTN and DHTN was noted with an increase in the stage of CKD, which is also clearly traced in the presented tables and drawings. In addition, it should be noted that the numbers of SHTN, DHTN were lower in 1 group of patients with CKD. The reliable dynamics of the average values of DHTNs in case of deterioration of the renal function was not revealed.

The distribution of degrees of hypertension by groups of examined patients and on the floor, as well as the distribution of patients by the duration of the course of the HTN is presented in the following table (Table 1).

These examined patients, with arterial hypertension, also determined intrauditive and long-term variability (LTV).

Indicators of HTN	1 group (n = 54)	2 group (n = 53)	3 group (n = 58)	4 group (n = 52)	
HTN 1 st , n = 25(22,52 %)	10 (40%)	6 (24%)	7 (28%)	2 (8%)	
Men, n = 14(56%)	4 (28,57%)	3 (21,43%)	5 (35,71%)	2 (14,29%)	
Women, n = 11(44%)	6 (54,5%)	3 (27,3%)	2 (18,2%)	-	
HTN 2 st , n = 67(60,36%)	19 (28,36%)	18 (26,86%)	16 (23,88%)	14 (20,89%)	
Men, n = 35(52,24%)	11 (31,43%)	10 (28,57%)	9 (25,71%)	5 (14,28%)	
Women, n = 32(47,76%)	8 (25,0%)	8 (25,0%)	7 (21,87%)	9 (28,13%)	
HTN 3 st , n = 19(17,12 %)	5(26,31%)	5(26,31%)	5(26,31%)	4 (21,05%)	
Men, n = 12(63,16%)	3(25,0%)	3(25,0%)	3(25,0%)	3(25,0%)	
Women, n = 7(36,84%)	2(28,57%)	2(28,57%)	2(28,57%)	1 (14,29%)	
Duration of HTN	10-20 years, n = 36	7 (19,44%)	8 (22,22%)	11 (30,56%)	10 (27,78%)
	20 years and older, n = 42	5 (11,90%)	9 (21,43%)	13 (30,95%)	15 (35,71%)

Table 1: Distribution of hypertension by degree and floor in examined patients by groups.

Intraudatic variability of blood pressure was evaluated by the absolute difference between sequential measurements during the initial examination in the condition of the primary health care link. Such an absolute difference between the first and second dimensions was considered that the difference in more than 5 mm Hg was considered in the clinical. At the same time, with the differences in SHTN between the 1st and 2nd dimensions of more than 5 mm Hg amounted to 79 patients (71.17%). Between the 2nd and 3rd measurements, the difference was observed in 77 patients (69.37%) and between the 1st and 3rd dimensions in 87 patients (78.38%) (Figure 2).



Figure 2: The frequency of identifying a reliable difference between sequential measurements of the SHTN.

Given the above results, we can say that one dimension when taking the patient, will not always reflect the true values of blood pressure, so the LTV can be considered specific and necessary for conducting.

It should be noted that during the study, various types of fluctuations in blood pressure were observed during sequential measurements with characteristic multidirection. On the basis of this, the following variants of fluctuations in blood pressure were identified during repeated measurements: 1. Explicable increase in the SHTN at the 2nd and 3rd dimensions, which was observed in 34 patients (30.63%of cases); 2. The reduction of blood pressure during repeated measurements of more than 5 mm Hg, which was found in 22 (19.82%) patients; 3. Fluctuations, having a difference of less than 5 mm Hg. between measurements, which was observed in 23 patients, which amounted to 20.72%; and 4. Group of multidirectional fluctuations in blood pressure, which was observed in 32 patients (28.83% of cases) (Figure 3). The last variant of oscillations, in turn, was divided into the following types: an increase at the 2nd and a decrease in 3 dimensions of the SHTN- in 5.41% of cases (in 6 patients); decrease at the 2nd and increase at 3 -18.02% of cases (in 20 patients). Lack of change in the SHTN at the 2nd and a decrease at the 3rd measurement- in 4 (3.6%) cases

and an increase in the value of the SHTN at the 2nd dimension and the absence of changes in the 3rd dimension-in 2 (1.8%) cases (Figure 4).

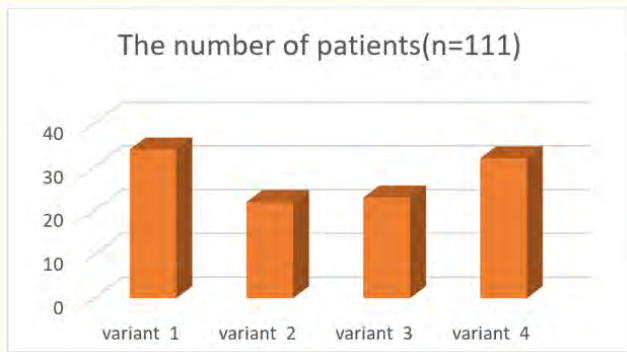


Figure 3: Occurrence of various types of variability of the SBP in observed patients, n = 217.

Note: Option 1- Conservative increase in blood pressure in the 2nd and 3rd dimensions; 2-a sequential decrease in blood pressure in the 2nd and 3rd dimensions; Option 3 - lack of a reliable difference between measurements; Option 4 - multidirectional fluctuations in blood pressure.

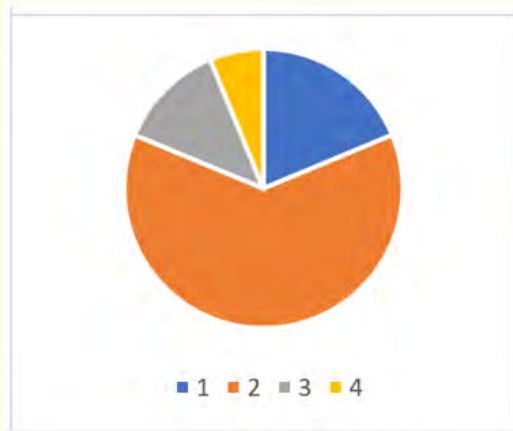


Figure 4: The occurrence of multidirectional fluctuations in blood pressure in the observed patients (P = 32).

Note: 1- increase at the 2nd and decrease in 3 dimensions; 2- decrease at the 2nd and increase at the 3rd; 3-lack of change in SBP at the 2nd and decrease at the 3rd dimension; 4- increasing the value of SBP at the 2nd measurement and the absence of a change in the 3rd dimension.

Depending on the changes in blood pressure, with a repeat of measurement, we identified three types of LTV. For type 1, the increase in the SHTN in the 3rd dimension was characteristic compared to the value of SBP in the 1st. The frequency of occurrence of this type was 58 (52.25%) from all cases of HTN. In the 2nd type, the value of the SHTN in the 1st dimension was greater than at the 3rd. Regarding to the 3rd type, the differences of SBP during repeated measurements that have not reached 5 mm RT. The incidence of these types was 23.42%.

After assessing the level of HTN, patients, if necessary, carried out antihypertensive therapy, which included two or more antihypertensive drugs, and only 11 (9.91%) patients received monotherapy. Antihypertensive therapy included antihypertensive drugs, while patients used from one to five drugs per day. So, for example, monotherapy was in 28 (25.23%) patients, the therapy of two drugs was used in 19 (17.12%) patients, the therapy of three drugs - 7 (6.31%) patients, combined therapy of four drugs - 2 (1.8%) patients, and in one (0.9%) patients, five drugs were used.

At the 2nd and 3rd stage, long-term variability was assessed. In the study of long-term and interdovent variability, based on self-control of patients and accounting for data on blood pressure, 57 (51.35%) patients reached targeted blood pressure values, which was 140 and 90 mm Hg, the rest of the patients of AG stabilized before lower level than the level of blood pressure during the initial examination. At the same time, the prolongation of the target values of blood pressure made it possible to reduce (in patients with 1 and 2 groups) and inhibition (in patients of 3 and 4 groups) of the progression of the development of CKD, which was manifested by stabilization of the numbers of GFS in these patients. It should be noted that when evaluating interspasive variability in 54 (48.69%) patients, an average difference was noted > 6.5 mm Hg ST (SHTN), this was a reliable criterion (p < 0.001) of the progression of the CKD stage, which may be a prognostically unfavorable extrarenal factor (Figure 5).

Thanks to this study, the presence of hypertension in 33 (15.2%) patients who already noted the development of CKD, as well as was in patients with CKD in the early stages has been pointed out a violation of fluctuations in intrauditive variability, meanwhile, the most unfavorable version of the LTV was observed

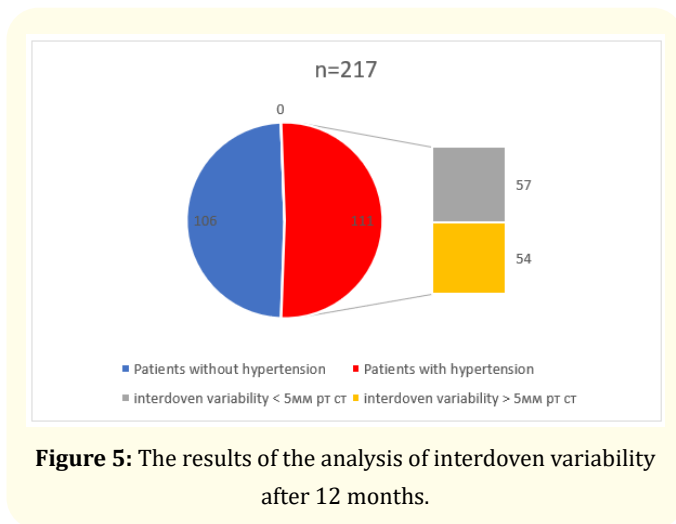


Figure 5: The results of the analysis of interdozen variability after 12 months.

in patients with severe stages of CKD (30.63%). Interior variability (> 6.5 mm Hg (SHTN)) was observed in 48.69% of the observed (p < 0.001) and may be a prognostically unfavorable extrarenal factor in the progression of CKD. Early diagnosis, adequate correction and achievement of the target level of blood pressure in patients with CKD in the early stages helps to reduce the progression of renal function (stabilization of GFS numbers was observed in 57 patients -51.35%, p < 0.01).

Output

Thus, thanks to the study, the presence of arterial hypertension as a risk factor for the progression of chronic kidney disease in the absence of clinical manifestations was revealed, the data indicate the need to study arterial hypertension as a risk factor for the development and progression of CKD already during the initial examination of patients. In the early diagnosis of risk factors, normalization of the level of HTN, and the achievement of target blood pressure numbers is more effective. For early diagnosis, as well as the prevention of the progression of chronic kidney disease, early diagnosis is required, correction and prolongation of the target level of blood pressure in patients with CKD already at the primary level of healthcare [1-19].

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