



## Diagnostic Significance Daily Monitoring of Blood Pressure in Young Women (Under 40 Years Old) with Arterial Hypertension

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**Abstract:** Arterial hypertension (AH) is one of the main factors in the progression of chronic kidney diseases. The prevalence of hypertension in kidney diseases exceeds the same indicator in the population in 2-3 ra for [2] and depends on the nosological form, the development of renal insufficiency, the age of patients [2, 13]. As the renal function decreases, the frequency of hypertension increases sharply, reaching 85-90% in terms of renal insufficiency, regardless of the nosology of the renal process [1], and the progression of chronic kidney diseases inevitably leads to an increase in the number of patients receiving renal replacement therapy. For two decades, the widespread clinical use of daily monitoring BP has become one of the most important achievements in cardiology, especially in the field of management of patients with arterial hypertension.

**Key words:** daily blood pressure monitoring, arterial hypertension, young women

**The purpose of the study:** to study the features of the daily blood pressure profile in young women under 40 years of age with hypertension.

### Materials and methods of research

52 women aged 18 to 40 years (mean age  $34.3 \pm 0.53$  years) with grade 1-3 hypertension were examined. The mean values of SBP were  $159.2 \pm 7.6$  mmHg, DBP -  $96 \pm 4.7$  mmHg. The prescription of hypertension ranged from 6 months to 8 years (on average  $4.5 \pm 0.8$  years); all women included in the study had not previously received antihypertensive treatment. Various variants of anxiety were detected in 63.6% of women, depression in 44.2% of the subjects. All patients had a regular menstrual cycle, however, 36 women (69.2%) included in the study used oral contraception, and 23 people (43.8%) continuously for more than three years. Overweight and obesity were detected in 47 women (90.3%), metabolic cardiovascular syndrome (according to the criteria of the IOC, 2009) was diagnosed in 90.3%. The young women included in the study did not have any disorders of carbohydrate metabolism.

Daily blood pressure monitoring was carried out in the "typical working day" mode during 24-26 hours on the device "Bplab-2" with the main oscillometric measurement method. The interval between measurements was 15 minutes during the daytime and 30 minutes at night. All patients during the

study filled out individual diaries, which reflected physical activity, mental and emotional stress during the daytime, bedtime and wake-up time, as well as sleep quality.

### Research results and their discussion

According to the above classification, hypertension in young women in our study belongs to the categories of mild and moderate. An increase in all the studied averages of both SAD and DAD was revealed, no cases of isolated systolic hypertension (ISAG) were registered. In the structure of hypertension, according to various studies, the prevalence of ISAG among men under 40 years of age varies significantly from 2 to 16%. Data on ISAG among women of this age category are limited, but indicate its lower prevalence compared to the male population [10]. Moreover, the question of the relative goodness of the increase in SAD in young people in the light of the phenomenon of "false systolic hypertension" is being actively discussed.

High numbers of systolic and diastolic blood pressure in the examined young women are directly associated with a high prevalence of potentially avoidable and unmodifiable cardiovascular risk factors. SAD correlated with the mass index body ( $r = 0.504$ ,  $p = 0.0001$ ), with waist circumference ( $r = 0.595$ ,  $p = 0.0001$ ), with glycemia ( $r = 0.395$ ,  $p = 0.005$ ), with age ( $r = 0.463$ ,  $p = 0.001$ ). DAD is in direct correlation with triglyceridemia ( $r = 0.364$ ,  $p = 0.009$ ) and reverse with HDL cholesterol ( $r = -0.281$ ,  $p = 0.050$ ).

From a practical point of view, when analyzing the daily monitoring BP data, the most interesting is the assessment of the differences between daytime and nighttime blood pressure – the degree of nocturnal decrease (DND) or the daily index (DI). The optimal DI value is 10-20 % (dipper), insufficient degree of nocturnal decrease in BP (non-dipper) at  $DI < 10\%$ , increased degree of nocturnal decrease in blood pressure (over-dipper or gipper-dipper) at  $DI > 20\%$ , a steady increase in night BP (night peaker) at  $DI < 0\%$ . Daily monitoring BP is the only method that provides reliable information about the level of night blood pressure and the degree of its decrease during sleep, – characteristics that are undoubtedly of high importance.

Relatively recently, it has been shown that the level of nocturnal BP itself, regardless of the level of daily or average daily BP, has a high prognostic value in relation to cardiovascular events and exceeds daytime BP in this respect [12]. It is known that patients with hypertension with a disturbed circadian BP profile, regardless of the type of change in the daily index, and women to a greater extent than men, have a higher risk of developing left ventricular hypertrophy, microalbuminuria, early atherosclerotic lesions of the extracranial part of the carotid arteries with the subsequent development of myocardial infarction and stroke [2].

According to the results of our study, the following categories of patients were identified: dipper - 6 people (11.5%), non-dipper - 29 women (55.8%), gipperdipper – 15 people (28.8%), night peaker – 2 women (3.8%). Thus, the majority of young women with hypertension had a prognostically unfavorable variant of circadian characteristics of BP, which indicates a violation of the two-phase rhythm of the functioning of the sympathetic department of the autonomic nervous system. A similar pattern with a predominance of non-dipper type patients is typical for a complex of metabolic disorders, associated with insulin resistance and android type of obesity, which has been widely reflected in the literature [8] and should be a kind of marker for a practitioner in terms of actively searching for violations of insulin-glucose homeostasis. Considering that more than half of the young women included in the study were non-dippers, for a targeted effect on the night BP needs to consider the need to prescribe antihypertensive drugs to them at night.

To quantify the time during which increased BP is recorded, the "pressure load" indicator (time index) is used. Its pathological values in young people are most often associated with the gradual depletion of the functional reserves of depressor systems, which have a latent character at the initial stages of the

disease, which is manifested by an inadequate reaction BP under physical and psycho-emotional stress, including in the framework of "stress-induced" hypertension [2]. The combined use of daily monitoring BP and independent registration of BP is essential expands the understanding of the blood pressure phenotype at the stages of diagnosis and evaluation of the effectiveness of treatment, especially when the results of clinical and outpatient measurements fall into different categories. In the category of women we studied, it was revealed that as the average blood pressure level increased, there was a significant increase in the time index (IV) both during the daytime and mainly at night, which, along with the recorded pathological change in circadian rhythms, is a prognostically unfavorable fact.

Arterial pressure, like all physiological parameters of the body, is characterized by fluctuations under the influence of various internal and external factors - variability. These fluctuations AD are not random, but they reflect the complex relationships between external factors that have not been fully investigated. (environment) and behavioral factors of the patient and regulatory mechanisms of the cardiovascular system.

The variability of BP (VBP) can be calculated by a number of indicators. The simplest method of estimation is the standard deviation (SD) from the mean BP. The disadvantage of this technique is a direct dependence on the time period for which the variability is calculated. An extended interpretation of the concept of variability implies circadian and other rhythmic changes in blood pressure, as well as indicators of daily monitoring BP [2].

The current wave of interest in VBP is associated with the accumulation of data on the prognostic value of inter-visit variability in relation to cardiovascular outcomes both in the general population and against the background of antihypertensive therapy [14]. High VBP is also unfavorably associated with intermediate endpoints, such as left ventricular hypertrophy, severity of retinopathy, glomerular filtration rate [3]. Thus, there are grounds to consider high VBP as an independent, independent unfavorable prognostic factor that requires assessment and monitoring against the background of therapy.

In the examined group of women during the daytime, the variability of SAD was increased in 37 women (71.1%), and DAD – in 8 patients (15.3%), at night, the analogous indicators were 5 people (9.6%) and 7 (13.4%), respectively. When studying the average indicators, an increase in the variability of SAD during the day was revealed, and the variability of SAD at night, as well as the daytime and nighttime variability of DAD had a borderline character.

The maximum increase in daily BCAD (up to 17 mmHg) was observed in persons with moderate hypertension, which, according to the diary entries of patients, was associated with stressful situations. The value of the VBP also depended depending on the severity of the pressure load on the day of monitoring, changing in direct proportion to the degree of its increase. The most studied characteristic of the morning peak of blood pressure is its value, determined by the difference between the maximum and minimum blood pressure in the period from 4 to 10 am. In order to more fully characterize the morning rise in blood pressure, the rate of blood pressure growth in the morning hours was estimated, which is of particular relevance for patients with a monotonous daily blood pressure profile.

Despite the normal values of the morning rise of SAD and the boundary values of DAD, a significant increase in the rate of morning rise was recorded both for SAD and mainly for DAD. With a more detailed analysis of the morning characteristics of blood pressure, it was found that patients with non-dipper and night peaker have a normal amount of morning rise in blood pressure, but a high rate of growth of blood pressure figures.

Thus, in young women suffering from hypertension, the magnitude of the morning rise in blood pressure, being an absolute indicator, may be uninformative and should be evaluated in conjunction

with the rate of change in blood pressure. High pulse blood pressure ( $\geq 60$  mmHg) in elderly patients with hypertension is now attributed to the defeat of target organs [6].

However, in the young age group, apparently, this characteristic also indicates an increased risk of cardiovascular complications and a faster progression of target organ damage. However, this assumption requires additional research to clarify the prognostic significance of this parameter at a young age. In the women we examined, the average daily pulse blood pressure was at the level of the borderline values of 46-53 mmHg in 67.4%, more than 53 mmHg in 32.6%. Thus, 100% of women did not have normal values of pulse blood pressure, and its increase was registered during periods of wakefulness, sleep and in general for 24 hours.

### Conclusion

In accordance with the new recommendations of the British Hypertensive Society, daily monitoring BP is indicated for all patients with clinical blood pressure  $\geq 140/90$  mmHg in order to confirm hypertension. Economic modeling has shown that such a diagnostic approach is associated with the lowest costs in all age groups, while the additional investments associated with the daily monitoring BP are balanced cost savings due to more targeted treatment [13]. In Russian conditions, in young women (up to 40 years old), taking into account the high life expectancy, the assessment of blood pressure figures should not be limited to the analysis of the average values of SAD and DAD in separate time intervals. It seems important to use daily monitoring BP not only for the diagnosis of hypertension, but also to study the quantitative and qualitative characteristics of blood pressure with the identification of individual components of its daily profile.

In young women (up to 40 years old) suffering from hypertension, without previous hypotensive therapy, the following prognostically unfavorable features of blood pressure were found: an increase in the average indicators of both systolic and diastolic blood pressure; the predominance of pathological types of daily curves with an insufficient decrease in blood pressure at night and an increase in the load of SAD and DAD mainly at night; high variability of SAD during the day; presumably increased and increased numbers of pulse blood pressure; high rate of morning rise of SAD and DAD.

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