Heart rate variability in patients with hypertension depending on the type of circadian blood pressure profile

Gorantla S.G.B. Krishna
V.N. Karazin Kharkiv National University, Ukraine
School of Medicine

Scientific supervisors: ass. prof. Petrenko O., MD,
prof. M. Yabluchansky, PhD, DMS

Arterial hypertension (AH) remains one of the most worldwide health and social problem due to its high prevalence, high risk of complications and the lack of adequate blood pressure (BP) control

Autonomic dysfunction

- Autonomic dysfunction, along with heredity and endocrine-metabolic imbalance is an important factor in the formation and progression of the AH. Therefore, the study of autonomic regulation may be the key to understanding the clinical and pathogenetic features of hypertension.
- At the present time to assess the state of the autonomic nervous system (ANS) is widely used study of heart rate variability (HRV). Studies in this area showed greater sympathetic drive in the early stages of AH, reduced HRV and increase very low frequency effects on the heart rhythm with the progression of the disease

The types of daily BP pattern

- A disorder of circadian rhythm of blood pressure (BP) is a a fairly common phenomenon in hypertensive patients.
- The daily fluctuations in BP have a biphasic rhythm and in the vast majority of people is reduced by 10-20% compared with day-time values.
- According to the degree of BP night-time reduction, the so-called “sleep-time relative BP decline”, the following types of daily BP pattern are distinguished:
  - «dippers» - physiological decrease in BP during the night - sleep-time relative BP decline 10-20%
  - «overdippers» - an excessive fall in BP at night, sleep-time relative BP decline ≥ 20%;
  - «nondippers» - the lack of BP reduction at night, sleep-time relative BP decline ≤ 10%;
  - «night-peakers» - night-time BP more than during daily activity, sleep-time relative BP decline < 0.

Hermida R.C. 2013 Ambulatory Blood Pressure Monitoring Recommendations for the Diagnosis of Adult Hypertension, Assessment of Cardiovascular and other Hypertension-associated Risk and Attainment of Therapeutic Goals / Ramón C. Hermida, Michael H. Smolensky, Diana E. Ayala [et al.] // Chronobiology International. – 2013. – Vol.30 (3). – P. 355-410.

The Aim

- To study HRV particular qualities in patients with AH, dependently of BP profile.

Materials and methods

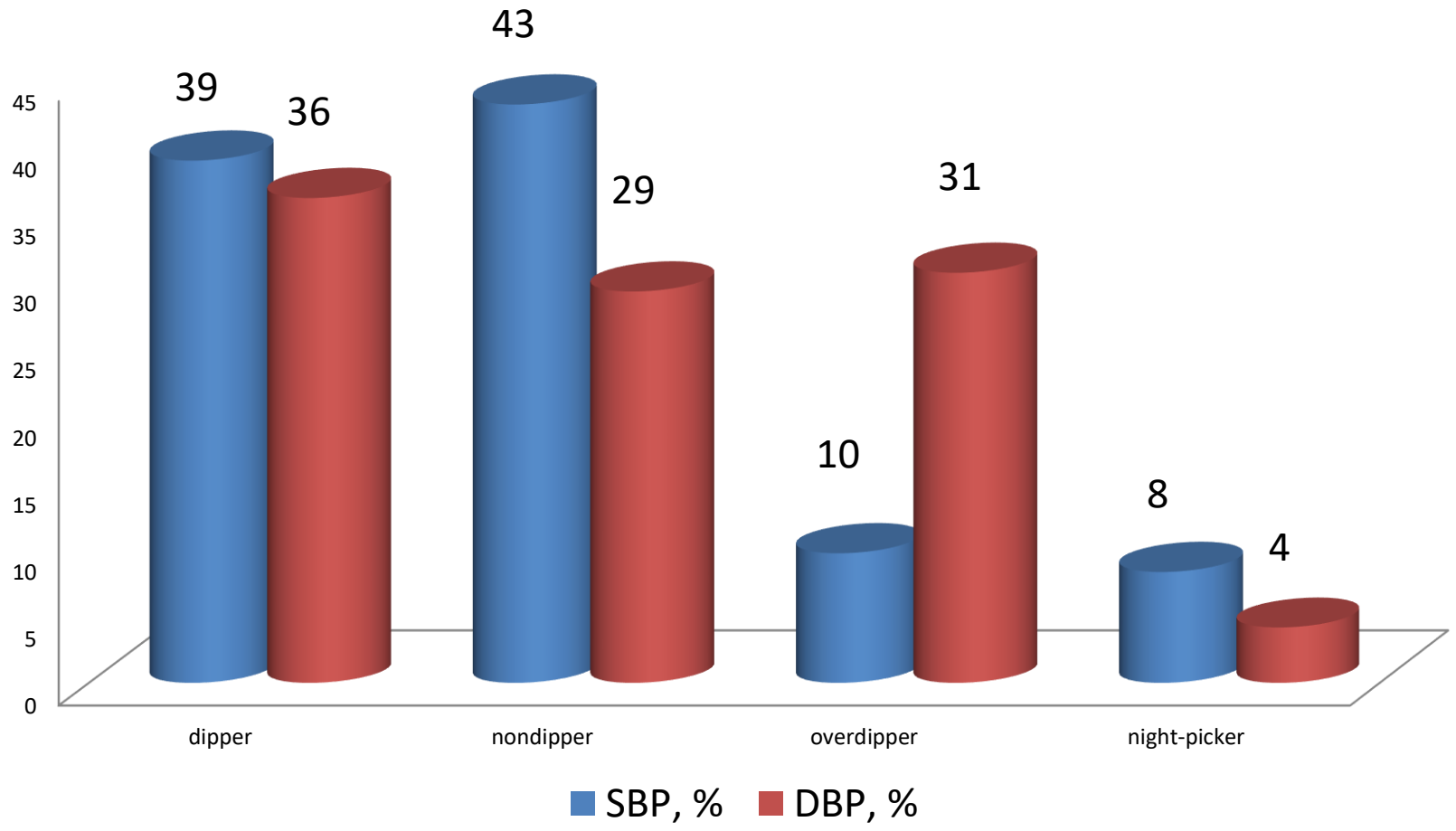
Option		%
Gender	Male	39
	Female	61
AH	I stage	15
	II stage	67
	III stage	18
	1 degree	36
	2 degree	22
	3 degree	14
CHF	I FC	22
	II FC	42
	III FC	8
IHD	Total	76
	Stable angina I-III FC	27
	Post MI	3

N =72,
Age 57 ± 11 years

Materials and methods

- Exclusion criteria were secondary arterial hypertension, hemodynamically significant valvular heart disease, cardiomyopathy of any origin, NYHA FC IV, any acute conditions (infection, trauma, surgery) during the previous 3 months, chronic diseases in the stage ща decompensation or exacerbation, neoplasms, as well as any circumstances that make it difficult to perform24-hour monitoring of blood pressure (ABPM) and ECG (ECG Holter monitoring).
- ECG Holter monitoring and ABPM was performed using a computer system "Kardiosens" (HAI Medica, Ukraine) with the oscillometric method of blood pressure measurement.
- The type of SBP and DBP daily profile was defined as was mentioned above
- HRV evaluation was carried out after exclusion of artifacts and arrhythmias. From the daily ECG record, 5-minute intervals were allocated, in the morning, during rest period, according to the patient diary. Frequency analysis method was used, and included the following parameters: total power (TP), low frequency (LF) (0.04-0.15 Hz), very low frequency (VLF) (0.003-0.04 Hz) and high frequency (HF) (0.15-0.4 Hz) components, the ratio LF/HF (index of the sympathovagal balance).
- Patients were divided into 4 groups according to the type of daily SBP profile and 4 groups - according to the type of daily DBP profile.

Distribution of the types of daily BP profiles in studied population

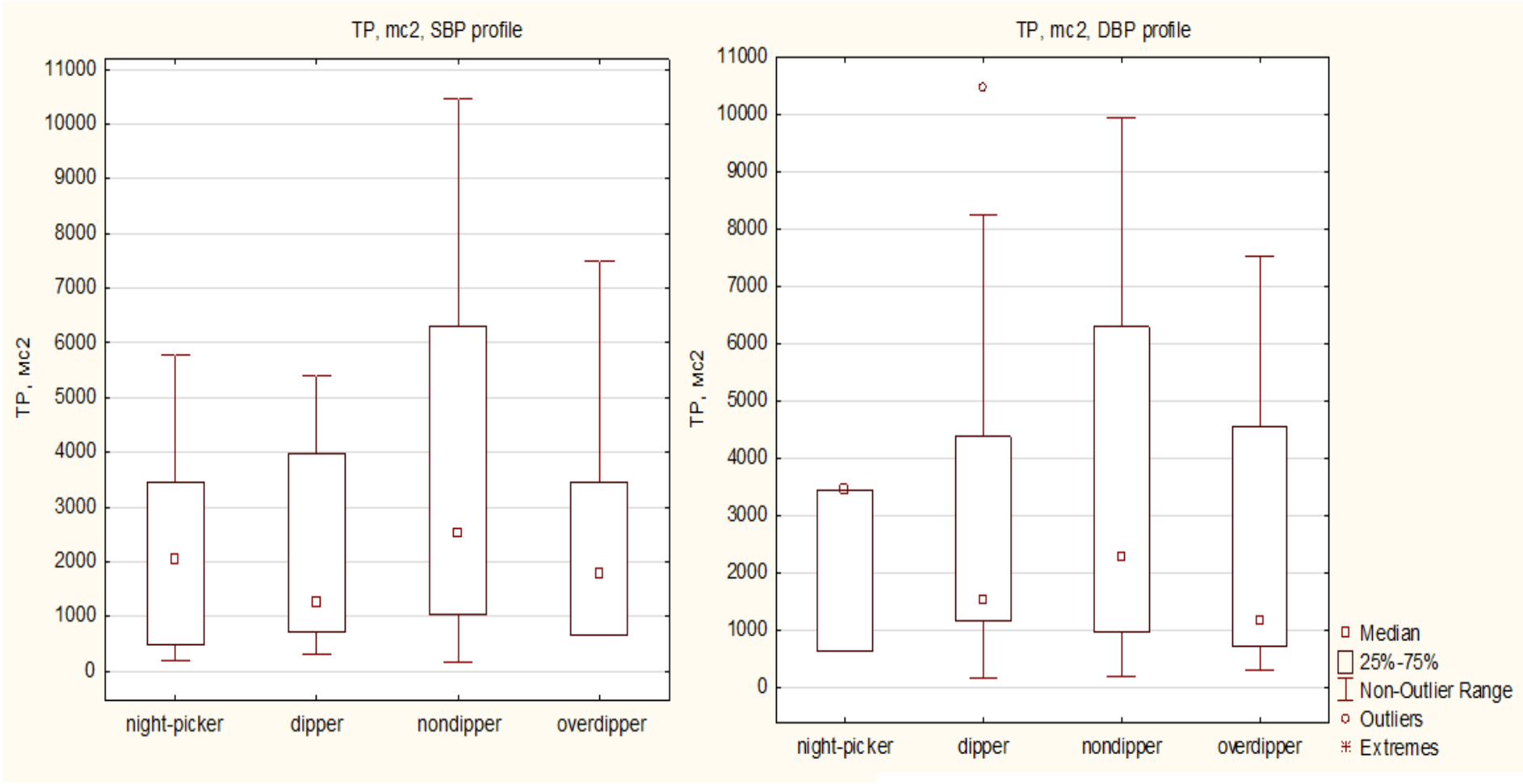


Tabl. 1. HRV parameters in patients with AH dependently of BP daily profile, mean± stand.dev.

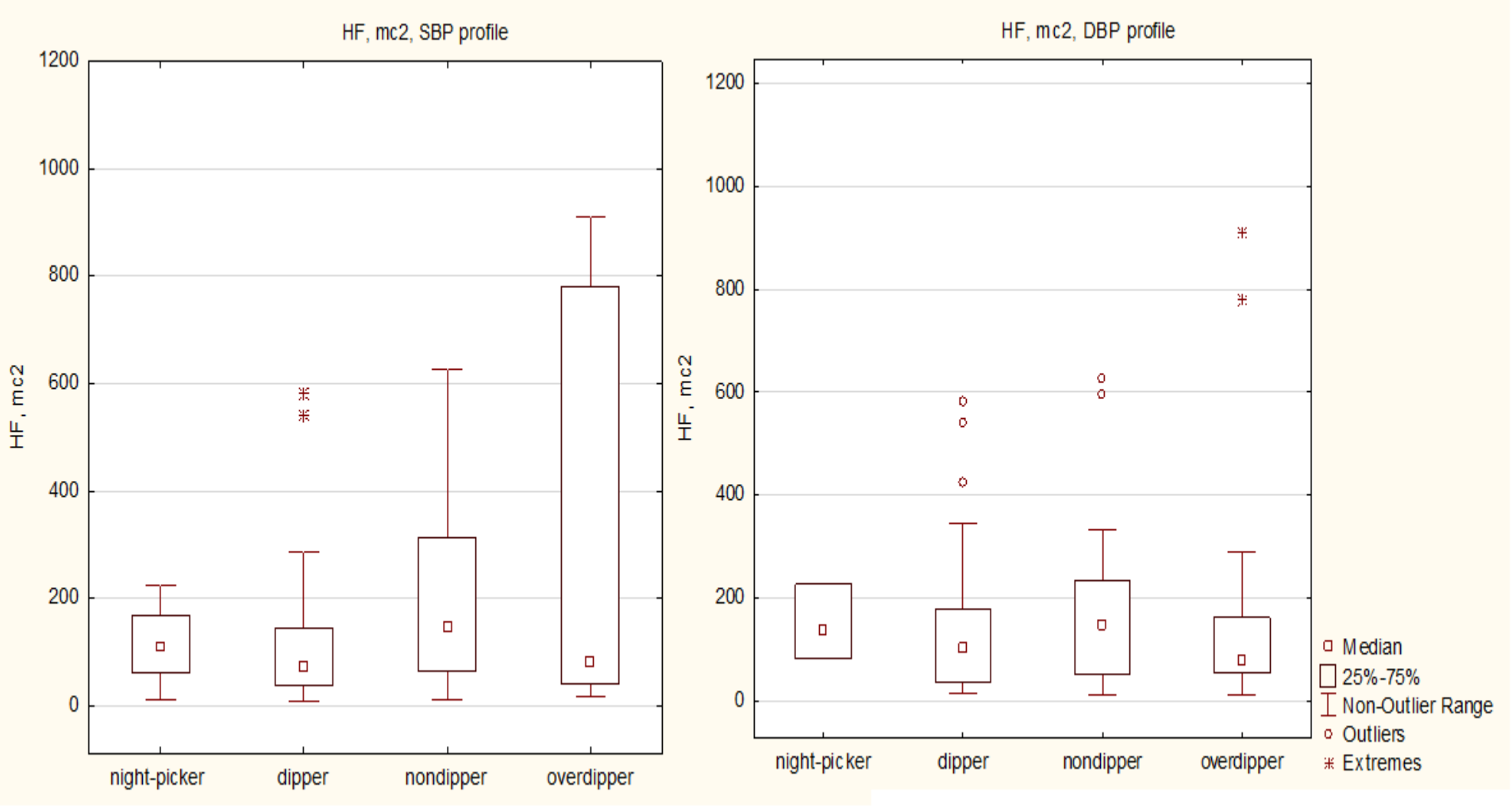
		TP	***HF***	***LF***	***VLF***	***LF/ HF***
SBP	dipper	2612±3728	118±140*	448±480*	1145±1104*	4,47±2,31*
	nondipper	3794±3244	300±476*	684±788*	1551±1501*	3,19±1,68*
	night-picker	2110±2436	92±61*	356±330*	950±1130	3,5±1,38*
	overdipper	2560±2466	292±383*	448±321*	864±575	3,56±2,26*
DBP	dipper	3240±4201	212±344*	612±772*	1263±11774	3,52±1,45*
	nondipper	3724±3300	277±479*	579±660*	1540±1644*	3,48±1,82*
	night-picker	2508±1619	147±73*	432±286*	1036±618	3,03±2,05
	overdipper	2396±2127	161±231*	443±368*	1092±985*	4,3±2,73
Normal values		3466 ± 1018	975 ± 203	1170 ± 416	765± 410	1.5 – 2.0

*significance level $p<0.05$.

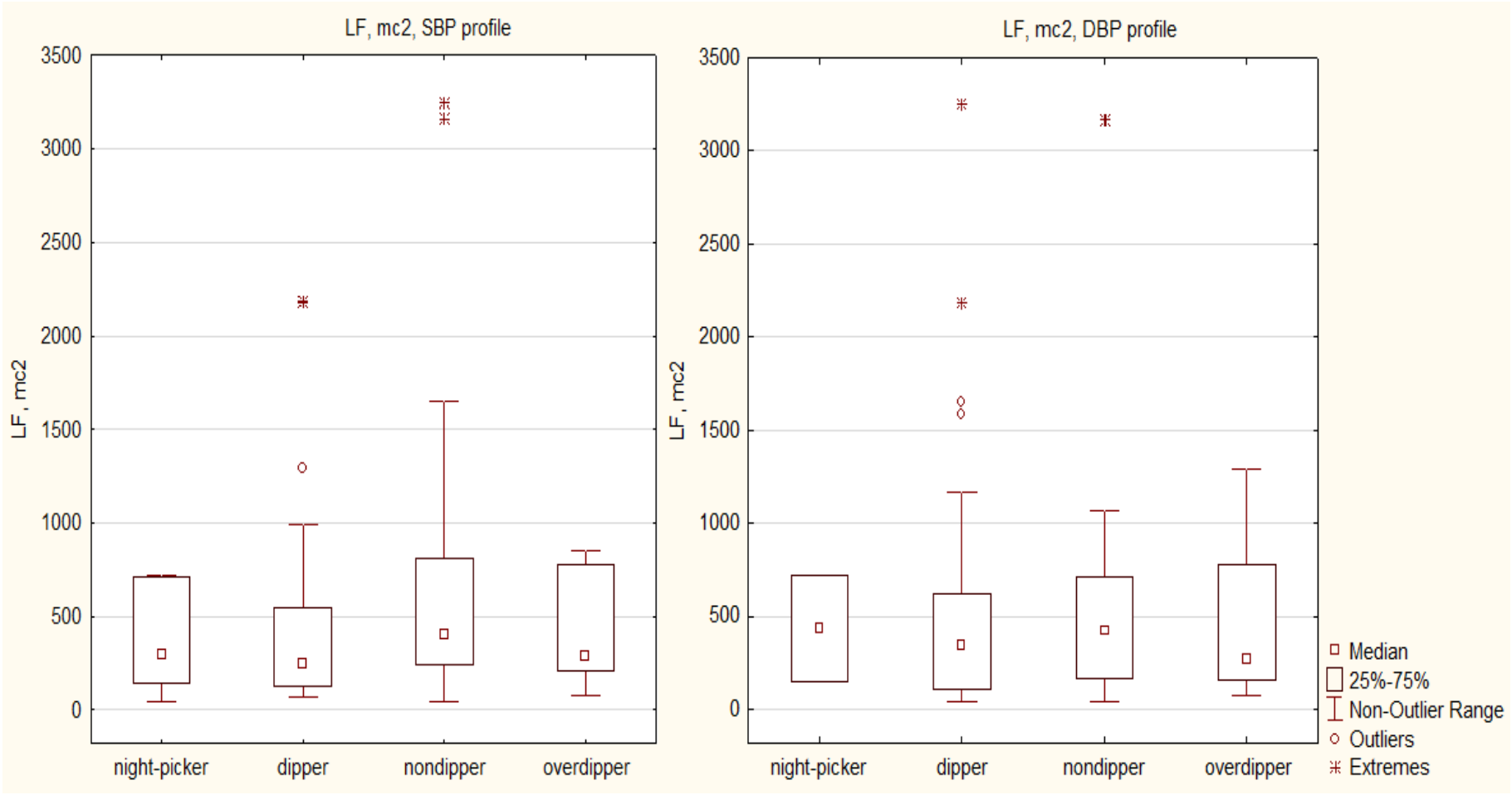
The total power (TP) of the HRV, depending on the type of daily profiles of SBP and DBP



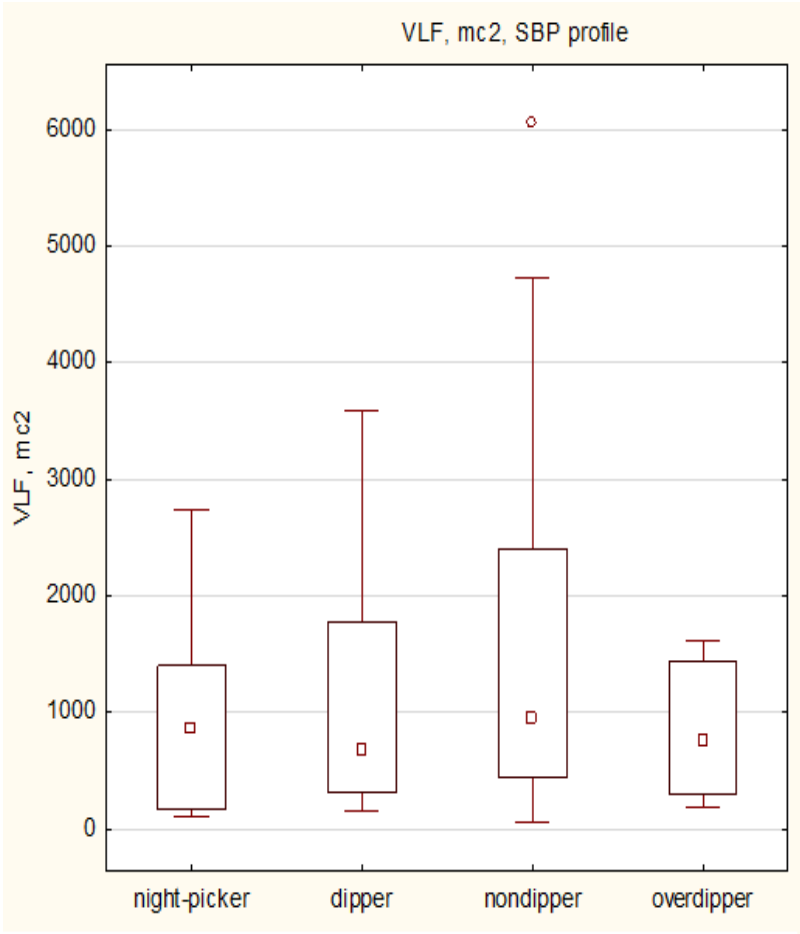
The high-frequency component (HF) of the HRV, depending on the type of daily profiles of SBP and DBP

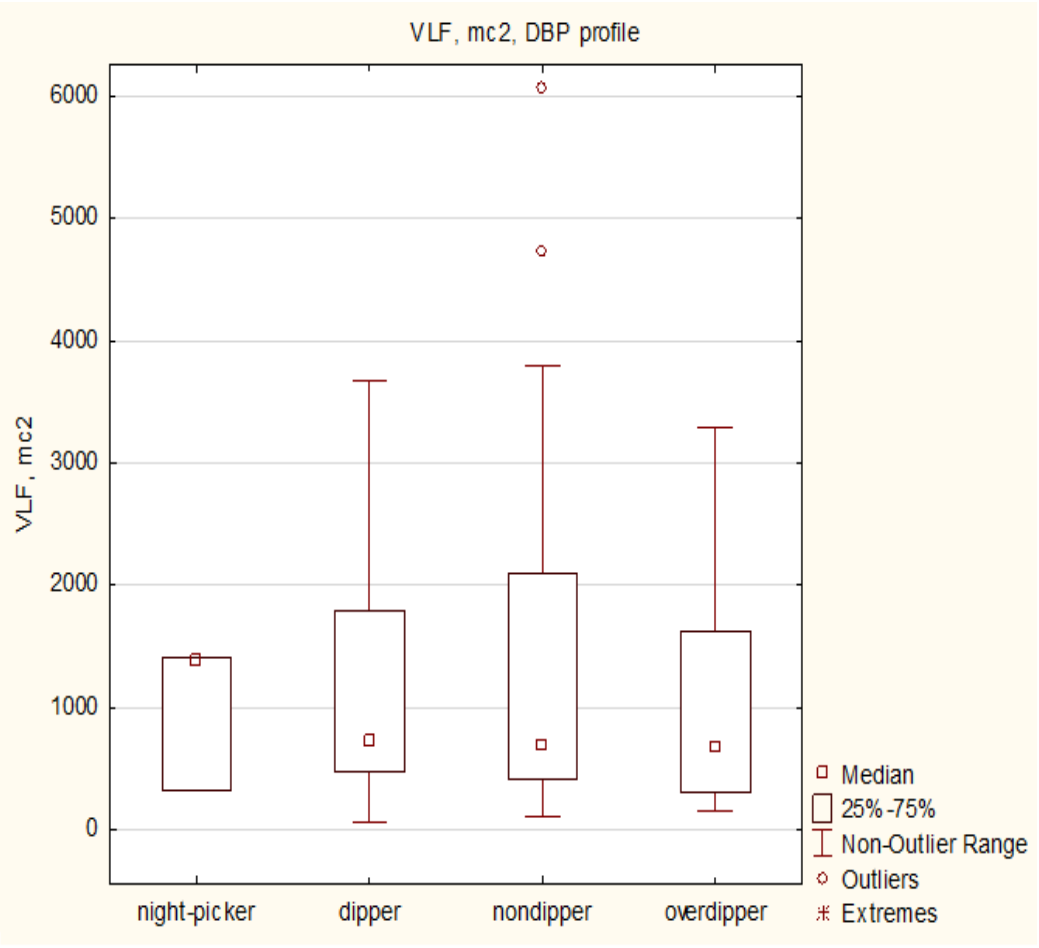


The low-frequency component (LF) of the HRV, depending on the type of daily profiles of SBP and DBP



The very low-frequency component (VLF) of the HRV, depending on the type of daily profiles of SBP and DBP





Conclusion

- The obtained results showed reduction of the total power mainly due to HF component
- The differences we found in HRV parameters in patients with AH in groups of BP daily profile types can be explained by the predominance of the sympathetic branch of regulation in the formation of pathological types of SBP and humoral factors predominance in the formation of pathological types of DBP.