

Dijagnostička vrijednost 24-satnog kontinuiranog mjerenja arterijskoga tlaka u ordinaciji liječnika obiteljske medicine

The Diagnostic Value of 24-Hour Ambulatory Blood Pressure Monitoring in Family Medicine Clinics

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SAŽETAK: Uvod: Arterijska je hipertenzija vodeći javnozdravstveni problem te čimbenik rizika za razvoj kardiovaskularnih i cerebrovaskularnih bolesti. Većinu bolesnika koji boluju od arterijske hipertenzije prate liječnici obiteljske medicine koji posjeduju potrebna znanja i vještine potrebne za dijagnosticiranje i liječenje te bolesti. U tome im uvelike pomaže 24-satno kontinuirano mjerenje arterijskoga tlaka (KMAT) koji ima veću dijagnostičku vrijednost u postavljanju dijagnoze arterijske hipertenzije od ambulantnog mjerenja vrijednosti arterijskoga tlaka (AT), a primjenjuje se i za praćenje kontrole bolesti te donošenje odluke pri odabiru terapije. Ovim radom željeli smo procijeniti korist uporabe 24-satnog KMAT-a u ordinaciji liječnika obiteljske medicine za postavljanje dijagnoze arterijske hipertenzije te praćenje bolesnika s već postavljenom dijagnozom. **Bolesnici i metode:** U presječnu studiju uključili smo 52 pacijenta u razdoblju od 4 mjeseca. Vrijednosti AT-a izmjerene 24-satnim KMAT-om usporedili smo s vrijednostima inicijalno izmjerenima u ordinaciji na dan pregleda. Razlika u postotku nekontrolirane hipertenzije dijagnosticirane ambulantnim mjerenjem AT-a, odnosno 24-satnim KMAT-om, testirana je primjenom χ^2 testom. Povezanost vrijednosti AT-a izmjerenih u ordinaciji i KMAT-om testirana je Spearmanovim koeficijentom korelacije. **Rezultati:** Istraživanje je obuhvatilo 18 muškaraca i 34 žene. Prosječna životna dob ispitanika bila je 56,06 godina. Prosječan 24-satni sistolički tlak bio je 156,13 mmHg, a dijastolički 89,81 mmHg. Prosječne vrijednosti sistoličkog i dijastoličkog AT-a izmjerenog u ordinaciji bile su 141,98 mmHg i 84,52 mmHg. Nekomontroliranu vrijednosti sistoličkoga tlaka dokazanu KMAT-om imalo je 47/52, a dijastoličkoga tlaka 36/52 pacijenata. Nekomontrolirane vrijednosti sistoličkoga tlaka izmjerenog u ordinaciji registrirane su u 29/52, a dijastoličkog u 9/52 pacijenta. **Zaključak:** Dobiveni rezultati mjerenja pokazali su da postoji pozitivna korelacija između vrijednosti arterijskih tlakova izmjerenih u ordinaciji i 24-satnim KMAT-om. Primjena KMAT-a pridonosi pravilnijem postavljanju dijagnoze arterijske hipertenzije te boljoj kontroli vrijednosti AT-a.

SUMMARY: Introduction: Arterial hypertension is a leading public health problem and a risk factor for the development of cardiovascular and cerebrovascular diseases. Most patients suffering from hypertension are monitored by family medicine physicians that have the requisite knowledge and skills needed to diagnose and treat this disease. This is greatly facilitated by 24-hour ambulatory blood pressure monitoring (ABPM), which has more diagnostic value for arterial hypertension than clinical measurement of blood pressure (BP) values and is also used for monitoring disease management and deciding on the therapy of choice. This article assesses the utility of 24-hour ABPM in family medicine clinics for establishing the diagnosis of arterial hypertension and monitoring patients with a previously established diagnosis. **Patients and Methods:** We included 52 patients in a cross-sectional study over a period of 4 months. BP values measured using 24-hour ABPM were compared with values initially measured at the clinic on the examination date. The difference in the percentage of uncontrolled hypertension diagnosed by clinical BP measurement in comparison with 24-hour ABPM was tested by applying the χ^2 test. The association between BP values measured at the clinic and those measured by ABPM was tested using Spearman's rank correlation coefficient. **Results:** The study comprised 18 men and 34 women. The average age of the participants was 56.06 years. Average 24-hour systolic pressure was 156.13 mmHg, and average diastolic pressure was 89.81 mmHg. The average values of systolic and diastolic pressure measured in the clinic were 141.98 mmHg and 84.52 mmHg, respectively. Uncontrolled systolic pressure demonstrated by ABPM was found in 47/52 patients, while 36/52 patients had uncontrolled diastolic pressure. In clinical measurements, uncontrolled systolic and diastolic BP values were registered in 29/52 and 9/52 patients, respectively. **Conclusion:** The measurement results demonstrate a positive correlation between BP values measured at the clinic and those measured using 24-hour ABPM. The application of ABPM contributes to correctly establishing the diagnosis of arterial hypertension and improved BP management.

KLJUČNE RIJEČI: arterijska hipertenzija, 24-satno kontinuirano mjerenje arterijskoga tlaka, obiteljska medicina.

KEYWORDS: arterial hypertension, 24-hours ambulatory blood pressure monitoring, family medicine.

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Uvod

Arterijska je hipertenzija globalna epidemija i vodeći je čimbenik rizika za smrtnost i pobol na globalnoj razini. Prema posljednjim smjernicama Europskog društva za arterijsku hipertenziju (*European Society of Hypertension, ESH*) i Europskoga kardiološkog društva (*European Society of Cardiology, ESC*) iz 2013. godine arterijska hipertenzija definira se vrijednostima arterijskoga tlaka (AT) višima od 140/90 mmHg izmjerjenima u ordinaciji baždarenim tlakomjerom¹. Prema navedenim smjernicama, dijagnoza arterijske hipertenzije treba se temeljiti na višestrukim mjerenjima AT-a u određenom razdoblju s obzirom na njegovu fiziološku varijabilnost. Jedan od važnijih nedostataka mjerenja AT-a u ordinaciji jest da tom metodom dobivamo vrijednosti u određenome vremenskom trenutku.

Prema podacima iz smjernica ESH-a/ESC-a, prevalencija arterijske hipertenzije u populaciji kreće se od 30 do 40 % i znatno raste sa životnom dobi¹. Podatci Svjetske zdravstvene organizacije (SZO) o prevalenciji upućuju na to da učestalost hipertenzije raste porastom populacije, životne dobi i čimbenika rizika (pušenje, alkohol, nedovoljna tjelesna aktivnost, povećanje tjelesne mase)². Osobe oboljele od hipertenzije imaju veći rizik za razvoj bolesti srca i krvnih žila i bolesti bubrega. Prema studiji *Epidemiologija arterijske hipertenzije u Hrvatskoj*, prevalencija hipertenzije u Hrvatskoj iznosi 37,5 % te je viša u žena (39,7 %) nego u muškaraca (35,2 %) ³. Na više vrijednosti AT-a u žena utjecali su i sljedeći čimbenici: viši indeks tjelesne mase, niža primanja, manja tjelesna aktivnost u odnosu prema muškarcima³. Unatoč tomu, žene su bile svjesnije svoje bolesti, češće su se liječile i postigle su bolju kontrolu vrijednosti AT-a³. Iako je arterijska hipertenzija povezana s preventabilnim čimbenicima rizika i postoje lijekovi za učinkovito liječenje i dalje je loše kontrolirana. U Hrvatskoj je samo 58,6 % stanovnika svjesno svoje arterijske hipertenzije, od njih se liječi 48,4 %, a samo 14,8 % ima kontrolirane vrijednosti AT-a⁴. Dvadesetčetirisaatno kontinuirano mjerenje arterijskoga tlaka (KMAT) neinvazivna je metoda za automatsko mjerenje vrijednosti AT-a tijekom razdoblja od 24 sata ili dulje i znači „zlatni standard“ u dijagnostici i praćenju arterijske hipertenzije⁵. Dijagnostička superiornost 24-satnog KMAT-a temelji se na preciznijem određivanju prave vrijednosti AT-a, mjerenju u realnim uvjetima, zanemarivim placeboefektom, razotkrivanju hipertenzije bijelog ogrtača i maskirne hipertenzije⁶. Nedostatci 24-satnog KMAT-a jesu nedovoljna dostupnost, relativno visoka cijena uređaja, neadekvatna mjerenja tijekom aktivnosti i ometanje bolesnika u svakodnevnim aktivnostima⁶. KMAT može poboljšati predviđanje kardiovaskularnog rizika u bolesnika te je indiciran u slučajevima kad postoji znatna varijabilnost ordinacijskog AT-a, izmjerene visoke vrijednosti AT-a u ordinaciji u osoba s niskim kardiovaskularnim rizikom, pri znatnim odstupanjima između vrijednosti kućnog i ordinacijskog AT-a, sumnje na hipotenzivne epizode, sumnje na rezistentnu hipertenziju, u trudnica s povišenim ordinacijskim AT-om i sumnje na preeklampsiju. Najveća studija do danas provedena o uporabi 24-satnog KMAT-a u primarnoj zdravstvenoj zaštiti provedena je u Španjolskoj, gdje je prije deset godina pokrenut nacionalni projekt za promicanje uporabom KMAT-a u svakodnevnom radu⁷. Studija je pokazala da su upotrebom KMAT-a identificirani bolesnici koji uistinu moraju uzimati antihipertenzivnu terapiju te je znatno smanjen broj osoba liječenih zbog hipertenzije⁷. Pokazalo se da uporaba KMAT-a dovodi do redukcije troškova

Introduction

Arterial hypertension is a global epidemic and the leading global risk factor for mortality and morbidity. According to the latest guidelines of the European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) from 2013, arterial hypertension is defined as blood pressure (BP) values higher than 140/90 mmHg measured at the clinic using a calibrated BP monitor¹. According to these guidelines, the diagnosis of arterial hypertension should be based on multiple BP measurements in a given period, depending on its physiological variability. One of the more significant shortcomings of BP measurement at the clinic is that this method provides BP values only at a particular point in time.

According to data from ESH/ESC guidelines, the prevalence of arterial hypertension in the general population is between 30% and 40% and increases significantly with age¹. Data from the World Health Organization (WHO) on its prevalence indicate that the frequency of hypertension rises with population growth, age, and risk factors (smoking, alcohol, insufficient physical activity, increased body mass)². Persons suffering from hypertension have a greater risk of developing heart, vascular, and kidney diseases. According to the *Epidemiology of arterial hypertension in Croatia study* (EH-UH), the prevalence of hypertension in Croatia is 37.5% and is higher in women (39.7%) than in men (35.2%)³. Higher BP values in women are also caused by the following factors: higher body-mass index, lower income, and less physical activity in comparison with men³. Despite that, women were more aware of their disease, received treatment more frequently, and achieved better BP control³. Although arterial hypertension is associated with preventable risk factors and drugs for effective treatment are available, it is still poorly managed. In Croatia, only 58.6% of the population is aware of their arterial hypertension, of which only 48.4% receive treatment and only 14.8% have controlled BP values⁴. Twenty-four-hour ambulatory blood pressure monitoring (ABPM) is a non-invasive method for automatic measurement of BP values over a period of 24 hours or longer and represents the “gold standard” in the diagnostics and monitoring of arterial hypertension⁵. The diagnostic superiority of 24-hour ABPM is based on more precise determination of true BP values, taking measurements in a realistic setting, negligible placebo effect, and revealing white coat hypertension and masked hypertension⁶. ABPM can improve cardiovascular risk assessment in patients and is indicated when there is significant variability in clinical BP, when high clinical BP values have been measured in persons with low cardiovascular risk, for significant deviations between home and clinical BP measurements, suspected hypotensive episodes, suspected resistant hypertension, and in pregnant women with elevated clinical BP and suspected preeclampsia. The largest study to date on the use of 24-hour ABPM in primary healthcare was conducted in Spain, where a national project to promote the use of ABPM in everyday practice was initiated ten years ago⁷. The study showed that the use of ABPM allowed identification of patients who truly required antihypertensive therapy and significantly reduced the number of persons treated for hypertension⁷. It was found that the use of ABPM lead to cost-reduction in the healthcare system and that the initial expenses investing in the purchase of the devices were compensated by savings from better and targeted treatment⁸. Data collected by ABPM are aver-

u zdravstvenom sustavu te da su početni troškovi ulaganja u kupnju uređaja bili nadoknađeni uštedama od boljeg i ciljanog liječenja⁸. Podatci koje nam daje KMAT prosječne su 24-satne vrijednosti, prosječne i maksimalne dnevne i noćne vrijednosti AT-a, ukupnu količinu iznad normale, varijabilnost tlaka, frekvenciju srca i njezinu varijabilnost, noćni pad i jutarnji skok tlaka. Adekvatni noćni pad tlaka (engl. *dipper*) pokazuje da su prosječne noćne vrijednosti tlaka za 10 – 20 % niže od prosječnih dnevnih vrijednosti⁹. Pad tlaka za manje od 10 % (engl. *non-dipper*) ili porast noćnoga tlaka (engl. *inverse dipper*) povezuje se s povećanim rizikom od kardiovaskularnih (KV) događaja, dijastoličke disfunkcije i hipertrofije lijeve klijetke, ventrikulske aritmije, progresije bubrežne bolesti, a češći je i u bolesnika sa šećernom bolesti, pretilih i u starijoj životnoj dobi⁹. Pad tlaka za više od 20 % (engl. *extreme dipper*) povezuje se s povećanom učestalošću moždanog udara i ishemije miokarda⁹. Krivulja 24-satnog KMAT-a pokazuje nam postoji li jutarnji skok tlaka, a to je vrijeme kada se pojavljuje većina KV i cerebrovaskularnih događaja, što je vjerojatno povezano s visokim porastom vrijednosti AT-a koji nastaje u vrijeme buđenja, porastom agregacije trombocita, smanjenjem fibrinolitičke aktivnosti i simpatičke aktivacije. Hipertenzija „bijelog ogrtača“ prisutna je u 10 do 40 % bolesnika, a u 30 – 60 % njih razvit će se trajna hipertenzija u idućih 5 godina⁵. Obrnut je fenomen maskirna hipertenzija koja se definira normalnim vrijednostima AT-a u ordinaciji, a povišenim vrijednostima tlaka mjerenih izvanambulantno ili KMAT-om. Ova vrsta hipertenzije prisutna je u 8 – 49 % populacije⁵.

Uređaj za KMAT teži otprilike 0,5 kg te s pomoću nadlaktične manšete omogućuje kontinuirano mjerenje vrijednosti AT-a u dnevnim i noćnim satima uz mjerenje frekvencije srca⁶. Uređaj se nosi u torbici pričvršćenom oko pojasa, nadlaktična se manšeta postavlja na nedominantnu ruku. Tijekom provođenja pretrage bolesnik bi trebao izbjegavati teže tjelesne aktivnosti i dizanje teških predmeta rukom na kojoj se mjeri AT. Svim pacijentima treba objasniti važnost vođenja dnevnika aktivnosti u koji se obavezno zapisuje vrijeme odlaska na spavanje, vrijeme buđenja i uzimanja terapije te sve eventualne tegobe koje osjeća tijekom dana ili noći⁹. Kako se uređaj ne bi oštetio, bolesnik se ne smije kupati niti tuširati, raditi s aparatima ili predmetima koji bi mogli oštetiti aparat, baviti se sportom zbog mogućeg pada i oštećenja aparata te ulaziti u sredinu u kojoj postoji povišeno elektromagnetsko zračenje⁹. Barem 70 % izmjerenih vrijednosti mora biti točno jer se inače mjerenje mora ponoviti⁹. Komplikacije KMAT-a su rijetke. Mogu se pojaviti modrice po koži ispod manšete, a su mogući su problemi sa snom zbog noćnog mjerenja. Prema smjernicama ESH-a/ESC-a, granične vrijednosti za arterijsku hipertenziju mjerene 24-satnim KMAT-om jesu: dnevni $\geq 135/85$ mmHg, noćni $\geq 120/70$ mmHg, 24-satni $\geq 130/80$ mmHg¹.

Pacijenti i metode

Ova presječna studija provedena je u razdoblju od 1. veljače 2017. do 31. svibnja 2017. u specijalističkoj ordinaciji obiteljske medicine u Varaždinu. Istraživanje je obuhvaćalo 52 uzastopna pacijenta starija od 18 godina. Svi su pacijenti pristali na sudjelovanje potpisivanjem informiranog pristanka. Prije potpisivanja informiranog pristanka pacijenti su proučili obrazac te im je odgovoreno na sva pitanja u vezi s istraživanjem. Inicijalno je svakom pacijentu izmjerena vrijednost AT-a u ordinaciji nakon 10 minuta mirovanja u sjedećem položaju na

age 24-hour values, average and maximal BP values during the day and the night, the total amount above normal values, pressure variability, heart frequency and its variability, and the nightly dip and morning rise in pressure values. The appropriate nightly dip in pressure is average nightly pressure values being 10-20% lower than average daytime values⁹. A night pressure drop in the range of less than 10% (non-dipper patients) or an increase in nocturnal BP (inverse dipper patients) is associated with an increased risk of cardiovascular (CV) events, diastolic dysfunction and left ventricular hypertrophy, ventricular arrhythmia, and kidney disease progression, and is more common in patients with diabetes, obese patients, and older patients⁹. Dipping pattern of nocturnal BP of more than 20% (extreme dipper) is associated with increased frequency of stroke and myocardial infarction⁹. The curve of the 24-hour ABPM shows us whether there is a morning rise in pressure, which is the time when most CV and cerebrovascular events occur, likely due to the large increase in BP values while waking up, increased thrombocyte aggregation, reduced fibrinolytic activity, and sympathetic activation. "White coat" hypertension is present in 10% to 40% of patients, and 30-60% will develop permanent hypertension in the next 5 years⁵. Masked hypertension is the reverse phenomenon, defined as normal BP in the clinic and elevated values when measured outside the clinic or using ABPM. This type of hypertension is present in 8-49% of the population⁵.

An ABPM device weighs approximately 0.5 kg, and the upper arm cuff allows continuous BP measurement during the day and the night, along with heart frequency measurements⁶. The device is carried in a purse attached to the belt, and the cuff is placed on the non-dominant hand. During ABPM, the patient should avoid strenuous physical activities and lifting heavy objects with the hand on which the device is placed. All patients should be aware of the importance of keeping an activity diary where they note the time they go to sleep, the time they wake up, taking medication, and all health issues that may occur during the day or night⁹. In order to avoid damaging the device, the patient may not take showers or baths, work with tools or objects that could damage the device, participate in sports due to the possibility of falling and damaging the device, and enter areas with increased electromagnetic radiation⁹. At least 70% of measured values must be correct, or the measurement must be repeated⁹. ABPM-related complications are rare. Bruising can appear on the skin under the cuff, and sleeping difficulties are possible due to night measurements. According to ESH/ESC guidelines, the normative values as measured by 24-hour ABPM are: daytime $\geq 135/85$ mmHg, nighttime $\geq 120/70$ mmHg, 24 hours $\geq 130/80$ mmHg¹.

Patients and Methods

This cross-sectional study was conducted in the period from February 1, 2017 to May 31, 2017 in the specialist family medicine clinic in the city of Varaždin. The study comprised 52 consecutive patients older than 18 years of age. All patients gave informed consent to participating the study by signing an informed consent form. Before signing, the patients examined the form and received answers to all questions related to the study. Initially, the BP values of every patient were measured in the clinic after 10 minutes at rest in a seated position in a chair with a backrest. Blood pressure was measured on

stolici s naslonom. Tlak se mjerio na nedominantnoj ruci s pomoću digitalnog tlakomjera (*MicroLife AFIB* tlakomjer) koji je na temelju triju mjerenja izračunao srednju vrijednost AT-a. Nakon toga pacijentu je postavljen uređaj za 24-satni KMAT također na nedominantnu ruku (*BTL Cardiopoint-ABPM*). Svim je pacijentima savjetovano da tijekom nošenja uređaja nastave sa svojim uobičajenim svakodnevnim aktivnostima te da izbjegavaju veća tjelesna opterećenja. Dan im je i dnevnik aktivnosti u koji su trebali unositi vrijeme uzimanja terapije, aktivnosti koje su imali, vrijeme spavanja i bilo koje druge simptome koje su oni smatrali bitnima (npr. simptomi povišenih vrijednosti AT-a). Uređaj je programiran tako da u vremenu od 6:00 do 22:00 mjeri vrijednosti AT-a svakih 30 minuta, a od 22:01 do 05:59 svakih 60 minuta. Za potrebe ovog istraživanja uzeli smo da je riječ o arterijskoj hipertenziji ako su vrijednosti AT-a izmjerene u ordinaciji bile $\geq 140/90$ mmHg, a one mjerene 24-satnim KMAT-om $\geq 130/80$ mmHg.

Unos podataka i njihova analiza provedeni su u programu Excel 2013, a vrijednosti $p < 0,05$ smatrane su statistički značajnima. Podatci su analizirani primjenom deskriptivne statistike: kvantitativni podatci aritmetičkim sredinama i standardnim devijacijama (dob i arterijski tlak) te medijanom i najvećom i najmanjom vrijednošću, a kvalitativni podatci apsolutnim frekvencijama. Analizom podataka izračunane su srednje vrijednosti AT-a tijekom 24-satnog mjerenja. Također je izračunan postotak pacijenta s kontroliranim i nekontroliranim vrijednostima AT-a mjenjenog ambulantno, odnosno KMAT-om. Razlika u učestalosti nekontrolirane hipertenzije dijagnosticirane ambulantnim mjerenjem AT-a, odnosno 24-satnim KMAT-om testirana je χ^2 testom. Povezanost AT-a izmjerenih u ordinaciji i KMAT-om testirana je Spearmanovim koeficijentom korelacije.

Rezultati

U razdoblju od 4 mjeseca u 52 pacijenta provedeno je mjerenje 24-satnim KMAT-om. Mjerenja su u svih pacijenata bila tehnički ispravna s prosječnim postotkom ispravnosti od 88 %. Bile su obuhvaćene 34 žene i 18 muškaraca, s prosječnom životnom dobi od $56,06 \pm 13,2$ godina. 47 pacijenata bili su nepušači. Prosječno vrijeme trajanja hipertenzije u pacijenata s već prije postavljenom dijagnozom bilo je 4,06 godina te su u terapiji imali od 1 do 3 antihipertenziva. **Tablica 1** detaljnije prikazuje demografske i zdravstvene karakteristike pacijenata.

Gotovo svi ispitanici imali su povećani indeks tjelesne mase (ITM), što pokazuje **tablica 2**. Prosječan ITM za sve je ispitanike iznosio $29,86 \pm 4,8$ kg/m².

Prosječan sistolički tlak mjenjen tijekom 24 sata bio je $156,13 \pm 27,16$ mmHg, a dijastolički $89,81 \pm 15,45$ mmHg. Prosječan sistolički i dijastolički tlak izmjeren u ordinaciji iznosio je $141,98 \pm 23,5$ mmHg i $84,51 \pm 9,89$ mmHg. **Tablica 3** prikazuje broj pacijenata s kontroliranim i nekontroliranim vrijednostima sistoličkog ili dijastoličkog tlaka izmjerenog u ordinaciji, odnosno KMAT-om. Nekontroliranu vrijednost sistoličkoga tlaka dokazanu KMAT-om imalo je 47/52, a dijastoličku 36/52 pacijenata. Broj pacijenata s nereguliranim vrijednostima AT-a temeljenima na ordinacijskom mjerenju bio je manji. Nekontrolirane sistoličke vrijednosti imalo je 29/52, a dijastoličke 9/52 pacijenata.

Rezultati su pokazali da ne postoji statistički značajna razlika između sistoličkoga tlaka izmjerenog KMAT-om i u

the non-dominant hand using a digital blood pressure monitor (*MicroLife AFIB*) which calculated the median BP value on the basis of three measurements. After this, the 24-hour ABPM device (*BTL Cardiopoint-ABPM*) was placed on the patient's non-dominant hand. All patients were advised to continue their usual daily activities while wearing the device and avoid more strenuous physical exertions. They were also given an activity diary in which they were instructed to input the time they took their medication, the activities they took part in, the time they went to sleep, and any other symptoms they considered relevant (e.g. elevated BP values). The device was programmed to measure BP every 30 minutes between 6:00 and 22:00 and every 60 minutes between 22:01 and 05:59. For the purposes of this study, we defined arterial hypertension as BP values measured in the clinic $\geq 140/90$ mmHg and $\geq 130/80$ mmHg measured by ABPM.

Data input and analysis was conducted in the Excel 2013 program, and P values < 0.05 were considered statistical significant. Data were analyzed with the application of descriptive statistics: quantitative data using arithmetic means and standard deviations (age and BP) as well as maximal, minimal, and median values, and qualitative data using absolute frequencies. Data analysis was used to calculate median BP values during 24-hour monitoring. We also calculated the percentage of patients with controlled and uncontrolled BP values measured at the clinic and with ABPM. The difference in frequency of uncontrolled hypertension diagnosed by ABPM and at the clinic was tested using the χ^2 test. The association between BP measured at the clinic and with ABPM was tested using Spearman's rank correlation coefficient.

Results

Over a period of 4 months, 52 patients underwent BP monitoring with 24-hour ABPM. The measurements were technically correct, with an average percentage of correct measurements of 88%. The study included 34 women and 18 men, with an average age of 56.06 ± 13.2 ; 47 patients were non-smokers. The average duration of hypertension in patients with a previously established diagnosis was 4.06 years, and their treatment included 1 to 3 antihypertensive drugs. **Table 1** contains a more detailed list of the demographic and health characteristics of the patients.

Almost all patients had an increased body mass index (BMI), as shown in **Table 2**. The average BMI for all participants was 29.86 ± 4.8 kg/m².

The average systolic and diastolic pressures measured over 24 hours were 156.13 ± 27.16 mmHg and 89.81 ± 15.45 mmHg, respectively. The average systolic and diastolic pressures measured in the clinic were 141.98 ± 23.5 mmHg and 84.51 ± 9.89 mmHg, respectively. **Table 3** show the number of patients with controlled and uncontrolled systolic and diastolic BP values measured in the clinic and with ABPM. Uncontrolled systolic BP values demonstrated by ABPM were found in 47/52 patients, and diastolic in 36/52 patients. The number of patients with unregulated BP values based on measurements in the clinic was lower. Uncontrolled systolic values were found in 29/52 patients, and diastolic in 9/52.

The results showed that there is no statistically significant difference between systolic pressure measured by

ordinaciji ($\chi^2 = 0,065$; $P = 3,84$) (**tablica 4**). Razlika između dijastoličkoga tlaka izmjenjenog KMAT-om i u ordinaciji bila je statistički značajna ($\chi^2 = 6,776$; $P = 3,84$) (**tablica 5**). U 11 pacijenata koji su imali uredne vrijednosti sistoličkoga tlaka izmjenjenih u ordinaciji primjenom 24-satnog KMAT-a dokazano je da su te vrijednosti ipak nekontrolirane. U 12 pacijenata koji su imali nekontrolirane vrijednosti sistoličkoga tlaka u ordinaciji, 24-satni KMAT pokazao je uredne vrijednosti. Ukupno 8 pacijenata s urednim vrijednostima dijastoličkoga tlaka izmjenjena u ordinaciji imalo je nekontrolirane vrijednosti mjerene KMAT-om. U 8 pacijenata čije su vrijednosti dijastoličkoga tlaka mjerene u ordinaciji bile neregulirane KMAT je pokazao uredne vrijednosti. Postoji pozitivna korelacija sistoličkoga i dijastoličkoga tlaka mjerena ambulantno i KMAT-om ($r = 0,703$ i $r = 0,771$).

ABPM and measured at the clinic ($\chi^2 = 0.065$; $P = 3.84$) (**Table 4**). The difference between diastolic pressure measured by ABPM and measured at the clinic was statistically significant ($\chi^2 = 6.776$; $P = 3.84$) (**Table 5**). ABPM showed normal values in 12 patients who had uncontrolled systolic values based on measurements in the clinic. A total of 8 patients with normal diastolic values as measured at the clinic had uncontrolled values when measured by ABPM. ABPM found normal values in 8 patients whose diastolic pressure values were unregulated when measured in the clinic. There was a positive correlation between systolic and diastolic pressure measured at the clinic and using ABPM ($r = 0.703$ and $r = 0.771$, respectively).

TABLE 1. Demographic and clinical characteristics of patients.

| | Mean | n (%) |
|---|-------|-------------|
| Age (years) | 56.06 | |
| Sex | | |
| Women | | 34 (65.00%) |
| Men | | 18 (35.00%) |
| Duration of hypertension (years) | 4.06 | |
| Number of antihypertensive | 1.35 | |
| Smoking | | |
| Yes | | 5 (9.61%) |
| No | | 47 (90.38%) |
| Diabetes mellitus | | |
| Yes | | 6 (11.53%) |
| No | | 46 (88.46%) |
| Body Mass Index (kg/m²) | | |
| Normal (18.5-24.9kg/m ²) | | 7 (13.46%) |
| Overweight (25.0-29.9 kg/m ²) | | 20 (38.46%) |
| Obesity (≥ 30.0 kg/m ²) | | 25 (40.07%) |
| Waist circumference (cm) | | |
| Normal | | |
| Women (< 80 cm) | | 6 (17.64%) |
| Men (< 94 cm) | | 12 (66.66%) |
| Abnormal | | |
| Women (> 80 cm) | | 28 (82.35%) |
| Men (> 94 cm) | | 6 (33.33%) |

TABLE 2. Distribution of body mass index according to sex.

| Body Mass Index (kg/m ²) | Men (n) | Women (n) | All (n) |
|---|---------|-----------|---------|
| Normal (18.5-24.9kg/m ²) | 3 | 4 | 7 |
| Overweight (25.0-29.9 kg/m ²) | 7 | 13 | 20 |
| Obesity (≥ 30.0 kg/m ²) | 8 | 17 | 25 |

TABLE 3. Frequency of controlled and uncontrolled blood pressure in 24-hour ambulatory blood pressure monitoring and office blood pressure measurements.

| | Controlled | | Uncontrolled | |
|--|------------|---------|--------------|---------|
| | SYS (n) | DIA (n) | SYS (n) | DIA (n) |
| 24-hour ambulatory blood pressure monitoring | 5/52 | 16/52 | 47/52 | 36/52 |
| Office blood pressure measurement | 23/52 | 43/52 | 29/52 | 9/52 |

SYS = systolic blood pressure; DIA = diastolic blood pressure

TABLE 4. Comparison of controlled and uncontrolled systolic blood pressure between office and ambulatory blood pressure measurements.

| 24-hour systolic blood pressure | Office systolic blood pressure | |
|---------------------------------|--------------------------------|--------------|
| | Controlled | Uncontrolled |
| Controlled | 22 | 12 |
| Uncontrolled | 11 | 7 |

$\chi^2=0.065$; $P=3.84$

TABLE 5. Comparison of controlled and uncontrolled diastolic blood pressure between office and ambulatory blood pressure measurements.

| 24-hour diastolic blood pressure | Office diastolic blood pressure | |
|----------------------------------|---------------------------------|--------------|
| | Controlled | Uncontrolled |
| Controlled | 13 | 8 |
| Uncontrolled | 8 | 23 |

$\chi^2=6.776$; $P=3.84$

Rasprava

Liječnici obiteljske medicine imaju važnu ulogu u praćenju i liječenju pacijenata s arterijskom hipertenzijom kako bi se postigli što bolji rezultati dobre kontrole AT-a. Dvadesetčetirisatni KMAT važan je za evaluaciju prognoze bolesti, redukciju broja lažno pozitivno postavljenih dijagnoza arterijske hipertenzije te bolje praćenje kontrole bolesti. Mjerenjem AT-a samo u ordinaciji možemo pogrešno proglasiti pacijente kao dobro regulirane te nam može promaknuti pravodobno postavljanje dijagnoze arterijske hipertenzije.¹⁰⁻¹⁵

Većina je dosadašnjih studija pokazala da ispitanici imaju više vrijednosti AT-a izmjerena u ordinaciji u usporedbi s KMAT-om. Međutim, te studije provedene su na općoj populaciji, ispitanicima koji ne uzimaju antihipertenzivnu terapiju te su mlađe životne dobi.¹⁶ Niže vrijednosti AT-a izmjerene u ordinaciji mogu biti posljedica činjenice da je većina pacijenata prije pregleda uzela svoju antihipertenzivnu terapiju. Dvadesetčetirisatnim KMAT-om učinak se antihipertenziva smanjuje. Također i brojni drugi čimbenici mogu utjecati na razlike AT-a izmjerenih u ordinaciji i KMAT-om, kao što su broj, vrijeme i raspored mjerenja.¹⁷ Vrijednosti AT-a izmjerenog u ambulanti i KMAT-om bile su više u pacijenata s već dijagnostičiranom arterijskom hipertenzijom, a slične su rezultate opisali i drugi autori.¹⁸ Sukladno već objavljenim istraživanjima uočene su više vrijednosti AT-a izmjerenih u ordinaciji i KMAT-om u starijih pacijenata.¹⁹ S obzirom na to da su vrijednosti sistoličkoga tlaka u korelaciji s većim kardiovaskularnim rizikom, praćenje njegovih vrijednosti najčešće je u fokusu pri donošenju odluke o promjeni i vrsti antihipertenzivne terapije. Pregledni članak objavljen 2011. godine koji je uspoređivao dijagnostičku točnost AT-a izmjerenog kod kuće i u ordinaciji s vrijednostima KMAT-a pokazuje kako se za postavljanje konačne dijagnoze ne treba oslanjati samo na povišene vrijednosti AT-a izmjerene kod kuće ili u ordinaciji već ih je potrebno potvrditi 24-satnim KMAT-om.²⁰ U promatranoj skupini ispitanika prosječna vrijednost AT-a bila je jasno iznad granica urednih vrijednosti. Vrijednosti AT-a bile su neregulirane, neovisno o tome uzimaju li pacijenti antihipertenzivnu terapiju ili ne. Ovo su opisali i drugi autori.¹⁹ Većina ispitanika u ovom istraživanju uzimala je od jednog do tri antihipertenziva pa se povišene vrijednosti AT-a mogu barem djelomično objasniti neadekvatnim terapijskim režimom i nesuradljivošću pacijenata u redovitom uzimanju terapije kako bi se postigle ciljane vrijednosti tlaka.

Ovo je istraživanje ograničeno malim brojem ispitanika te njegovim provođenjem u samo jednom centru. Ispitanici su bili starije životne dobi s već dijagnostičiranom arterijskom hipertenzijom koji uzimaju barem jedan antihipertenziv. Mjerenje AT-a tijekom 24 sata ovisno je i o pridržavanju uputa o nošenju uređaja i pacijentovu ponašanju tijekom provođenja pretrage. Činjenica da dubina sna, pacijentovo psihičko stanje i tjelesna aktivnost tijekom dana utječu na vrijednosti AT-a također ima utjecaj na reproducibilnost dobivenih rezultata jer se navedeni čimbenici nisu uzimali u obzir tijekom interpretacije dobivenih rezultata.

Zaključak

Dobiveni rezultati mjerenja pokazali su da postoji pozitivna korelacija između mjerenja AT-a u ordinaciji i 24-satnim KMAT-om. Ovi podatci mogu podržati primjenu KMAT-a u

Discussion

Family medicine physicians have an important role in the monitoring and treatment of patients with arterial hypertension with the goal of achieving the best possible results in BP management. Twenty-four-hour ABPM is important for the evaluation of disease prognosis, reducing the number of false-positive diagnoses of arterial hypertension, and improved monitoring of disease management. Only measuring BP in the clinic can lead to misdiagnosing patients as well-regulated and cause physicians to miss establishing a timely diagnosis of arterial hypertension.¹⁰⁻¹⁵

Most studies conducted so far showed that participants had higher BP values measured at the clinic in comparison with ABPM. However, these studies were conducted in the general population, with participants who were not receiving anti-hypertensive therapy and were of a younger age.¹⁶ Lower BP values measured in the clinic could be a consequence of the fact that most patients took their anti-hypertensive medication before the examination. Twenty-four-hour ABPM reduces the effect of anti-hypertensive drugs. Numerous other factors can influence the differences in BP measured at the clinic and with ABPM, such as the number, times, and schedule of measurements.¹⁷ BP values measured in the clinic and using ABPM were higher in patients with previously diagnosed arterial hypertension, and similar results were described by other authors as well.¹⁸ In line with previously published studies, we found higher BP values measured both in the clinic and using ABPM in older patients.¹⁹ Given that systolic pressure values correlate with higher cardiovascular risk, monitoring these values is usually the focus when deciding changes and types of anti-hypertensive therapy. A review article published in 2011, which compared the diagnostic accuracy of BP measured at home and at the clinic with ABPM values, demonstrated that the establishment of the final diagnosis should not rely only on values of BP measured at home and at the clinic but should also be confirmed using 24-hour ABPM.²⁰ In the observed group of patients, the average BP value was clearly above normal values. The BP values were unregulated, regardless of whether the patients were receiving anti-hypertensive therapy or not. This was described by other authors as well.¹⁹ Most participants in this study were receiving one to three anti-hypertensive drugs, so the elevated BP values can be at least partially explained by inadequate treatment regimens and lack of patient compliance in regularly taking the treatment to achieve target pressure values.

The current study was limited by the small number of participants and the fact that it was conducted in a single center. The participants were older and had previously diagnosed arterial hypertension for which they were taking at least one anti-hypertensive drug. Measuring ABPM over 24 hours also depends on compliance to the rules on wearing the device and the behavior of the patient during the test. Depth of sleep, the patient's psychological state, and physical activity during the day also influence BP values and have an effect on the reproducibility of the results, since these factors were not considered during their interpretation.

Conclusion

The results showed that there was a positive correlation between BP measurement at the clinic and with 24-hour ABPM.

svakodnevnom radu liječnika obiteljske medicine u okviru pristupa pacijentima s novodijagnosticiranom arterijskom hipertenzijom, kao i praćenju pacijenata s već postavljenom dijagnozom. Usporedbom dviju metoda mjerenja tlaka, KMAT-om i ambulantno, mogu se lakše definirati vrsta i uzrok hipertenzije. Pravodobno prepoznavanje i liječenje arterijske hipertenzije važno je radi prevencije kardiovaskularnih i cerebrovaskularnih komplikacija, odnosno mortaliteta općenito. Primjena KMAT-a može se uspješno implementirati u svakodnevni rad, a time se podiže kvaliteta zbrinjavanja i liječenja bolesnika s arterijskom hipertenzijom.

These data support the application of ABPM in the everyday practice of family physicians as part of their approach to patients with newly-diagnosed arterial hypertension, as well as in monitoring patients with an existing diagnosis. Comparing the two methods of blood pressure measurement, at the clinic and using ABPM, can facilitate correctly determining the type and cause of hypertension. Timely recognition and treatment of arterial hypertension is important for the prevention of cardiovascular and cerebrovascular complications and mortality in general. The application of ABPM can be successfully implemented in everyday practice, thereby raising the quality of care and treatment of patients with arterial hypertension.

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Korekcija Erratum

Errata corrige: U članku "Jelaković B, Baretić M, Čikeš M, Dika Ž, Fištrek Prlić M, Jelaković A, et al. Praktične smjernice za postavljanje dijagnoze arterijske hipertenzije Hrvatskog društva za arterijsku hipertenziju Hrvatskoga liječničkog zbora i Radne skupine za arterijsku hipertenziju Hrvatskoga kardiološkog društva. *Cardiol Croat.* 2017;12(11-12):413-451." u tiskanoj inačici potrebno je ispraviti tablicu 31. na stranici 424. Sada donosimo ispravnu tablicu 31.

Correction notice: In the printed version of the article "Jelaković B, Baretić M, Čikeš M, Dika Ž, Fištrek Prlić M, Jelaković A, et al. Practical guidelines for diagnosing arterial hypertension of the Croatian Society of Hypertension of Croatian Medical Association and the Working Group on Hypertension of the Croatian Cardiac Society. *Cardiol Croat.* 2017;12(11-12):413-451." it is necessary to correct Table 31 on page 424. The correct Table 31 is shown below.

TABLICA 31. Stratifikacija ukupnoga rizika na temelju vrijednosti arterijskoga tlaka, drugih čimbenika rizika, oštećenja ciljnih organa i prisutnog pobola.

| Drugi čimbenici rizika, asimptomatsko oštećenje organa ili bolest | Arterijski tlak | | | |
|---|---|---|--|---|
| | Visoko normalan SAT 130 - 139 i/ili DAT 85 - 89 | Stupanj I. AH SAT 140 - 159 i/ili DAT 90 - 99 | Stupanj II. AH SAT 160 - 179 i/ili DAT 100 - 109 | Stupanj III. AH SAT ≥180 i/ili DAT ≥110 |
| Bez drugih ČR-a | Nizak rizik | Nizak rizik | Umjeren rizik | Visok rizik |
| 1 - 2 ČR | Nizak rizik | Umjeren rizik | Umjeren do visok | Visok rizik |
| ≥3 ČR | Nizak do umjeren | Umjeren do visok | Visok rizik | Visok rizik |
| OCO, KBB stadij 3 ili ŠB | Umjeren do visok | Visok rizik | Visok rizik | Vrlo visok rizik |
| Simptomatska KBS, KBB ≥ 4 ili ŠB s OCO i/ili ČR | Vrlo visok rizik | Vrlo visok rizik | Vrlo visok rizik | Vrlo visok rizik |

AH – arterijska hipertenzija; SAT – sistolički arterijski tlak; DAT – dijastolički arterijski tlak; ČR – čimbenici rizika – vidjeti u tablici 30; OCO – oštećenje ciljnih organa; KBB – kronična bubrežna bolest; ŠB – šećerna bolest; KBS – koronarna bolest srca