POVEZANOST KONZUMIRANJA ALKOHOLNIH PIĆA I ARTERIJSKE HIPERTENZIJE

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ASSOCIATION BETWEEN ALCOHOL CONSUMPTION AND ARTERIAL HYPERTENSION

Jelena Zajc[1]

[1] Dom zdravlja Pančevo, Pančevo, Srbija

[1] *Community Health Center Pančevo, Pančevo, Serbia*

SAŽETAK

Uvod/Cilj: Arterijska hipertenzija je stanje hronično povišenog arterijskog krvnog pritiska ≥ 140/90 mmHg, koje predstavlja jedan od vodećih uzroka smrtnosti i u svetu i u Srbiji. Cilj istraživanja je da se utvrdi povezanost između konzumiranja alkoholnih pića i arterijske hipertenzije.

Metode: Ova studija preseka obuhvatila je 57 ispitanika sa šireg područja Grada Pančeva, oba pola (30 žena i 27 muškaraca), starijih od 18 godina, koji nisu uzimali antihipertenzivnu terapiju. Za prikupljanje podataka o konzumiranju alkoholnih pića sprovedena je anketa, za koju je korišćen modifikovani Upitnik o prehrambenim navikama (engl. *Food Frequency Questionnaire at a Glance*), Nacionalnog instituta za zdravlje, Betesda, Merilend, Sjedinjene Američke Države (engl. *National Institutes of Health – NIH, Bethesda, Maryland, United States of America*). Merenje arterijskog krvnog pritiska obavljeno je prema preporučenoj proceduri, pri čemu je srednja vrednost izračunata i visina arterijskog krvnog pritiska kategorizovana u skladu sa klasifikacijom Evropskog udruženja kardiologa (engl. *European Society of Cardiology – ESC*), te Evropskog udruženja za hipertenziju (engl. *European Society of Hypertension – ESH*) iz 2018. godine. Podaci su obrađeni korišćenjem *SPSS* (engl. *Statistical Package for Social Sciences*) softverske aplikacije, korišćen je Fisherov test tačne verovatnoće, sa pragom statističke značajnosti od $p < 0,05$, a rezultati su predstavljeni tabelarno i tekstualno.

Rezultati: U analiziranoj populaciji, od 43 ispitanika, koji nisu rizično konzumirali alkoholna pića, 35 (81,4%) ispitanika nije imalo hipertenziju, dok je hipertenziju imalo 8 (18,6%) ispitanika. Od 14 ispitanika koji su rizično konzumirali alkoholna pića, 13 (92,9%) ispitanika nije imalo hipertenziju, dok je jedan (7,1%) ispitanik imao hipertenziju. Nije postojala statistički značajna razlika u prisustvu hipertenzije u odnosu na frekvenciju konzumiranja alkoholnih pića ($p > 0,05$).

Zaključak: Ne postoji povezanost između konzumiranja alkoholnih pića i arterijske hipertenzije.

Ključne reči: arterijska hipertenzija, alkoholna pića, studija preseka

ABSTRACT

Introduction/Aim: Arterial hypertension is a condition of chronically elevated levels of arterial blood pressure of 140/90 mmHg and higher, and is one of the leading causes of death, both worldwide and in Serbia. The aim of this study is to examine the association between the consumption of alcoholic beverages and arterial hypertension.

Methods: This cross-sectional study included 57 participants of both sexes (30 women and 27 men), over 18 years of age, from the wider area of the City of Pančevo, who were not on antihypertensive therapy. A survey was conducted to collect data on alcohol consumption, using the modified *Food Frequency Questionnaire at a Glance* of the National Institutes of Health, Bethesda, Maryland, USA. Measurement of arterial blood pressure was performed according to the recommended procedure, wherein the mean value was calculated, and the level of arterial blood pressure was categorized, in accordance with the classification of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH), from 2018. The data was processed in SPSS (Statistical Package for Social Sciences), the Fisher's exact test was applied, with the statistical significance threshold set at $p < 0.05$. The results are presented in textual and tabular form.

Results: In the analyzed population, of the 43 participants who did not engage in risky alcohol consumption, 35 (81.4%) participants did not have hypertension, while 8 (18.6%) participants had hypertension. Among the 14 participants who engaged in risky alcohol consumption, 13 (92.9%) participants did not have hypertension, while one (7.1%) participant had hypertension. There was no statistically significant difference regarding the presence of hypertension with respect to the frequency of alcohol consumption ($p > 0.05$).

Conclusion : There is no association between the consumption of alcoholic beverages and arterial hypertension.

Key words: arterial hypertension, alcoholic beverages, cross-sectional study

Autor za korespondenciju:
Jelena Zajc
Dom zdravlja Pančevo, Pančevo
Šumadijska 47/44, 11080 Zemun, Srbija
Elektronska adresa: dr.jelenazajc@gmail.com

Corresponding author:
Jelena Zajc
Community Health Center Pančevo, Pančevo
47/44 Šumadijska *Street, 111080 Zemun , Serbia*
E-mail: dr.jelenazajc@gmail.com

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UVOD

Kardiovaskularni sistem se sastoji od grupe tkiva i organa koji imaju za cilj distribuciju tečnog medijuma – krvi do perifernih tkiva i organa, kako bi se obavljala razmena materija i gasova i omogućio metabolizam. Jedan od najbitnijih kardiovaskularnih parametara je arterijski krvni pritisak (AKP), koji omogućava generisanje perfuzionog pritiska kroz kapilarno korito u tkivu [1]. AKP mora biti na odgovarajućem nivou kako bi se protok krvi kroz tkivo odvijao efikasno, ali hronično povišene vrednosti arterijskog krvnog pritiska dovode do povećanog rizika od nastanka po život opasnih patofizioloških mehanizama [2]. U većini slučajeva, hipertenzija je idiopatska (nepoznatog uzroka), sa najverovatnijom genetskom predispozicijom i poligenskim nasleđivanjem u svojoj osnovi (familijarna predispozicija, učešće većeg broja gena sa obaveznim učinkom faktora sredine, kao što su stres, ishrana, itd.) [3]. Faktori rizika za pojavu hipertenzije mogu se podeliti na one na koje je moguće uticati i one na koje nije moguće uticati. Među faktorima rizika na koje je moguće uticati spadaju: nepravilna ishrana (koja uključuje prekomerno konzumiranje soli, hrane bogate zasićenim mastima i transmastima, te nedovoljno konzumiranje voća i povrća), pušenje, konzumiranje alkohola, fizička neaktivnost, stres, kao i prisutnost drugih komorbiditeta kao što su dijabetes melitus i druga slična stanja. Faktori rizika na koje nije moguće uticati uključuju: starost, pol, rasu i genetsku predispoziciju [2].

Hipertenzija je i dalje vodeći uzrok smrti modernog čoveka širom sveta, sa preko 10 miliona smrtnih slučajeva godišnje [4]. Podaci Svetske zdravstvene organizacije (SZO) govore da više od 40,0% ljudi starijih od 25 godina ima hipertenziju, a u Evropi je taj procenat i viši (preko 45,0%), dok je u Srbiji oko 43,0% [5].

Prema podacima Svetske zdravstvene organizacije, u svetu je, 2019. godine, oko 2,3 milijarde ljudi, starosti 15 i više godina, konzumiralo alkohol u prethodnih 12 meseci, a prosečna potrošnja po osobi je iznosila 6,4 l čistog alkohola godišnje [6].

Alkoholna pića su najzastupljenija psihoaktivna supstanca u Srbiji. U populaciji uzrasta od 18 do 64 godine starosti, više od 70,0% stanovnika je barem jedanput u prethodnih 12 meseci konzumiralo alkoholno piće (82,1% muškaraca i 62,4% žena) [7]. Trećina odraslog stanovništva u Srbiji (31,6%), u 30 dana koja su prethodila istraživanju, konzumirala je alkohol dva do tri puta. Svakodnevno konzumiranje alkoholnih pića je u Srbiji, prema rezultatima istog istraživanja, bilo prisutno kod 3,4% stanovništva. Popularnost piva, vina i žestokih pića je prilično ravnomerna, ipak, skoro polovina konzumenata alkohola u Srbiji preferira pivo [8].

INTRODUCTION

The cardiovascular system consists of a group of tissues and organs whose function is to distribute the liquid medium - blood to peripheral tissues and organs, so as to carry out the exchange of substances and gases and enable metabolism. One of the most important cardiovascular parameters is arterial blood pressure (ABP), which enables the generation of perfusion pressure within the capillary bed in the tissue [1]. ABP must be at an appropriate level in order for blood flow through the tissue to take place efficiently, however, chronically elevated values of arterial blood pressure result in increased risk of life-threatening pathophysiological mechanisms [2]. In most cases, hypertension is idiopathic (of unknown origin), with genetic predisposition and polygenic inheritance most likely being at its root (familial predisposition, participation of a large number of genes with the obligatory effect of environmental factors, such as stress, nutrition, etc.) [3]. Risk factors for the occurrence of hypertension can be divided into those that can be influenced and those that cannot be influenced. Among the risk factors that can be influenced are the following: poor diet (which includes excessive consumption of salt, foods rich in saturated fats and trans fats, and insufficient consumption of fruits and vegetables), smoking, alcohol consumption, lack of physical activity, stress, as well as the presence of other comorbidities such as diabetes mellitus and other similar conditions. Risk factors which we have no control over include the following: age, sex, race, and genetic predisposition [2].

Hypertension remains the leading cause of death in modern societies worldwide, with over 10 million deaths per year [4]. World Health Organization (WHO) data show that more than 40.0% of people above the age of 25 years have hypertension; in Europe this percentage is even higher (over 45.0%), while in Serbia it is about 43.0% [5].

According to the data of the World Health Organization, in 2019, around 2.3 billion people aged 15 and over had consumed alcohol in the preceding 12 months, and the average consumption per person was 6.4 l of pure alcohol per year [6].

Alcoholic beverages are the most prevalent psychoactive substance in Serbia. In the population aged 18 to 64 years, more than 70.0% had consumed an alcoholic beverage at least once in the preceding 12 months (82.1% of men and 62.4% of women) [7]. A third of the adult population in Serbia (31.6%) had consumed alcohol two to three times in the 30 days preceding the survey. Daily consumption of alcoholic beverages in Serbia, according to the results of the same survey, was present in 3.4% of the population. The popularity of beer, wine and spirits is fairly evenly

Preporuke za konzumiranje alkohola variraju u zavisnosti od zemlje i organizacije koja ih izdaje. Prema američkom Nacionalnom institutu za zloupotrebu alkohola i alkoholizam (engl. *National Institute on Alcohol Abuse and Alcoholism*), umereno konzumiranje alkohola za zdrave odrasle osobe podrazumeva unos do jednog pića dnevno za žene i do dva pića dnevno za muškarce. Jedno standardno piće sadrži oko 14 g alkohola, što odgovara jednoj flašici piva od 355 ml, čaši vina od 148 ml ili čaši žestokog pića od 44 ml [9].

Međutim, važno je napomenuti da se konzumiranje alkohola ne preporučuje svim osobama, posebno ne osobama sa određenim zdravstvenim stanjima, kao što su trudnice, osobe koje pate od zloupotrebe alkohola, kao i osobe sa hroničnim bolestima [9].

Preporuke o rizičnom konzumiranju alkohola takođe se razlikuju, međutim, opšte smernice koje se često navode, jesu da se rizičnim smatra konzumiranje više od četiri standardna pića svakog dana ili više od 14 standardnih pića nedeljno, za muškarce, te više od tri standardna pića svakog dana ili više od 7 standardnih pića nedeljno, za žene [9].

Mehanizmi delovanja alkohola na AKP su složeni i još uvek nisu u potpunosti razjašnjeni. Predloženi su brojni mogući mehanizmi, kao što su neravnoteža centralnog nervnog sistema, oštećenje kontrole baroreceptora, pojačana simpatička aktivnost, stimulacija renin-angiotenzin-aldosteronskog sistema, povećanje nivoa kortizola, povećana vaskularna reaktivnost usled povećanja nivoa intracelularnog kalcijuma, stimulacija endotela da oslobađa vazokonstriktore i gubitak relaksacije usled inflamacije i oksidativnog oštećenja endotela, što dovodi do inhibicije proizvodnje azot monoksida zavisnog od endotela. Gubitak relaksacije usled inflamacije i oksidativnog oštećenja endotela od strane angiotenzina II je glavni uzročnik hipertenzije izazvane alkoholom [10].

Alkohol ima akutne i hronične efekte na AKP. Visoka doza alkohola (> 30 g alkohola za muškarce i > 20 g alkohola za žene) ima dvofazni efekat na AKP, smanjuje krvni pritisak do 12 sati nakon konzumiranja i povećava AKP posle više od 13 sati nakon konzumiranja. Visoka doza alkohola povećava frekvenciju srca u svakom trenutku nakon konzumiranja, do 24 sata od unosa alkohola. Nalazi ovog istraživanja su relevantni uglavnom za zdrave muškarce, pošto je samo mali broj žena uključen u ispitivanja [11].

Kontinuirano konzumiranje alkohola, preko 30 g dnevno, značajno i zavisno od doze, povećava rizik od hipertenzije. Razlike u osetljivosti arterijskog krvnog pritiska na unos alkohola postoje među različitim etničkim grupama, kao i među polovima [12].

U istraživanju koje su sproveli Santana i saradnici, 2018. godine, utvrđeno je da je malo i umereno ispi-

distributed, however, almost half of alcohol consumers in Serbia prefer beer [8].

Recommendations for alcohol consumption vary, depending on the country and the organization that issues them. According to the US National Institute on Alcohol Abuse and Alcoholism, moderate alcohol consumption for healthy adults means up to one drink per day, for women, and up to two drinks per day, for men. One standard drink contains about 14 g of alcohol, which corresponds to one 355 ml bottle of beer, one 148 ml glass of wine or one 44 ml glass of spirits [9].

However, it is important to note that alcohol consumption is not recommended to all individuals, especially people with certain health conditions, such as pregnant women, people suffering from alcohol abuse, and people with chronic diseases [9].

Recommendations on risky drinking also vary. However, general guidelines that are often applied are that drinking more than four standard drinks per day or more than 14 standard drinks per week, for men, and more than three standard drinks per day or more than 7 standard drinks per week, for women, is considered risky [9].

The mechanisms of the effect of alcohol on ABP are complex and have as yet not been fully elucidated. A number of possible mechanisms have been proposed, such as central nervous system imbalance, impaired baroreceptor control, increased sympathetic activity, stimulation of the renin-angiotensin-aldosterone system, increased cortisol levels, increased vascular reactivity due to increased intracellular calcium levels, stimulation of the endothelium to release vasoconstrictors, and loss of relaxation due to inflammation and oxidative damage to the endothelium, leading to inhibition of endothelium-dependent nitric oxide production. Loss of relaxation due to inflammation and oxidative damage to the endothelium by angiotensin II is the main cause of alcohol-induced hypertension [10].

Alcohol has acute and chronic effects on ABP. A high dose of alcohol (> 30 g of alcohol for men and > 20 g of alcohol for women) has a biphasic effect on ABP, reducing blood pressure up to 12 hours after consumption and increasing ABP 13 hours or more upon consumption. A high dose of alcohol increases the heart rate at any point in time after consumption, up to 24 hours after alcohol intake. The findings of this study are relevant mainly for healthy men, since only a small number of women were included in the research [11].

Continuous consumption of over 30 g of alcohol per day, significantly and dose-dependently increases the risk of hypertension. Differences in the sensitivity of arterial blood pressure to alcohol intake exist among different ethnic groups, as well as between sexes [12].

janje alkoholnih pića (≤ 2 čaše alkoholnog pića dnevno, za muškarce i ≤ 1 čaše alkoholnog pića dnevno, za žene) imalo protektivne efekte, u smislu hipertenzije i koronarne bolesti srca, ali nije bilo dokaza za to, dok dokazi da dugotrajno konzumiranje alkohola dovodi do hipertenzije postoje. Ovo istraživanje se odnosi na razlike u osetljivosti krvnog pritiska na konzumiranje alkohola između polova. Muškarci su imali relativni rizik od hipertenzije za konzumiranje jednog do dva pića dnevno. Sa druge strane, žene nisu imale povećan rizik od hipertenzije pri konzumiranju jednog do dva pića dnevno, ali su imale znatno veći rizik od hipertenzije u odnosu na muškarce pri konzumiranju alkohola preko ove količine [13].

Mogući povoljni efekti umerenog konzumiranja alkohola se moraju odmeriti u odnosu na štetne efekte većeg konzumiranja, uključujući povećani rizik od hipertenzije, kardiomiopatije i hemoragijskog moždanog udara. Unos više od tri pića dnevno povezan je sa povišenjem AKP-a, a konzumiranje više od četiri pića dnevno prosečno dovodi do povećanja sistolnog pritiska za 5 – 6 mmHg i dijastolnog pritiska za 2 – 4 mmHg [14].

Cilj ovog istraživanja je da se utvrdi da li postoji povezanost između konzumiranja alkoholnih pića i arterijske hipertenzije kod ispitanika sa šireg područja grada Pančeva, oba pola, starijih od 18 godina, koji nisu na antihipertenzivnoj terapiji.

METODOLOGIJA

Studija preseka je obuhvatila 57 ispitanika sa šireg područja grada Pančeva, oba pola (30 žena i 27 muškaraca), starijih od 18 godina, koji nisu uzimali antihipertenzivnu terapiju. Istraživanje je sprovedeno tokom decembra meseca 2022. godine.

Za prikupljanje podataka o konzumiranju alkoholnih pića sprovedena je anketa, za koju je korišćen modifikovani Upitnik o prehrambenim navikama (engl. *Food Frequency Questionnaire at a Glance*), Nacionalnog instituta za zdravlje, Betesda, Merilend, SAD (engl. *National Institutes of Health – NIH, Bethesda, Maryland, USA*) [15]. Upitnik sadrži pitanja u vezi sa većinom grupa namirnica, ali za potrebe ovog istraživanja, korišćena su samo pitanja koja se odnose na alkoholna pića (pivo, belo vino, crno vino i žestoka pića). Pitanja su se odnosila na prosečnu upotrebu alkoholnih pića tokom prethodne godine i učestalost njihovog konzumiranja (jedan do tri puta mesečno, jednom nedeljno, dva do četiri puta nedeljno, jednom dnevno, dva do tri puta dnevno, više od četiri puta dnevno ili nikada). Na osnovu učestalosti konzumiranja alkohola određene su dve kategorije (grupe) ispitanika – oni koji piju rizično i oni koji ne piju rizično, posebno za svaku vrstu alkoholnih

In the study by Santana et al., conducted in 2018, it was determined that low and moderate drinking of alcoholic beverages (≤ 2 glasses of an alcoholic beverage per day, for men and ≤ 1 glass of an alcoholic beverage per day, for women) had protective effects, in terms of hypertension and coronary heart disease, but there was no evidence for this, while there is evidence that long-term alcohol consumption leads to hypertension. This research was focused on gender differences in the sensitivity of blood pressure to alcohol consumption. Men had a relative risk of hypertension when consuming one to two drinks per day. On the other hand, women did not have an increased risk of hypertension when consuming one to two drinks per day, but they had a significantly higher risk of hypertension, as compared to men, when consuming alcohol exceeding this amount [13].

The possible beneficial effects of moderate alcohol consumption must be weighed against the harmful effects of heavy consumption, including the increased risk of hypertension, cardiomyopathy, and hemorrhagic stroke. Intake of more than three drinks per day is associated with an increase in ABP, while consumption of an average of more than four drinks per day leads to an increase in systolic pressure by 5 – 6 mmHg and in diastolic pressure by 2 – 4 mmHg [14].

The aim of this study is to determine whether there is an association between the consumption of alcoholic beverages and arterial hypertension in respondents of both sexes, older than 18 years, who are not on antihypertensive therapy, residing in the wider area of the City of Pančevo.

METHODOLOGY

This cross-sectional study included 57 respondents of both sexes (30 women and 27 men), older than 18 years, who were not taking antihypertensive therapy, residing in the wider area of the City of Pančevo. The research was conducted in December 2022.

For the purpose of collecting data on the consumption of alcoholic beverages, a survey was conducted using a modified version of the *Food Frequency Questionnaire at a Glance*, of the National Institutes of Health, Bethesda, Maryland, USA [15]. The questionnaire contains questions related to most food groups, but for the purpose of this research, only questions related to alcoholic beverages (beer, white wine, red wine, and spirits) were used. The questions referred to the average use of alcoholic beverages during the preceding year and the frequency of their consumption (one to three times a month, once a week, two to four times a week, once a day, two to three times a day, more than four times a day, or never). Based on the frequency of alcohol consumption, two categories

pića i ukupno za sva alkoholna pića. Ispitanici koji su naveli da konzumiraju alkohol jednom nedeljno ili manje su kategorisani kao nerizični, dok su oni koji piju više od jednom nedeljno kategorisani kao rizični.

Merenje AKP-a je obavljeno u skladu sa preporučenom procedurom za rutinsko merenje krvnog pritiska, u ordinaciji, u standardizovanim uslovima, a u skladu sa preporukama *ESC*-a/*ESH*-a iz 2018. godine [16]. Arterijski krvni pritisak svih 57 ispitanika je izmeren analognim sfigmomanometrom. Pre merenja AKP-a, ispitanici su bili smešteni u mirnom okruženju pet minuta. Meren je AKP na obe nadlaktice korišćenjem odgovarajuće veličine manžete u odnosu na obim nadlaktice (izmeren je AKP na obe ruke radi otkrivanja mogućih razlika između njih, ruka sa višom vrednošću uzeta je kao referenca). Zabeležena su tri merenja AKP-a, u razmacima od 1 – 2 munuta. Za prosečnu vrednost AKP-a uzeta su poslednja dva merenja. Svakom ispitaniku određen je stepen AKP-a, a prema prihvaćenom kriterijumu za hipertenziju (≥ 140/90 mmHg). Kada je AKP meren u ordinaciji lekara određene su kategorije (grupe) ispitanika – kategorija onih sa hipertenzijom i onih bez hipertenzije. Klasifikacija nivoa AKP-a određena je u skladu sa preporukama *ESC*-a/*ESH*-a iz 2018. godine [16].

Podaci su obrađeni korišćenjem *SPSS* (engl. *Statistical Package for Social Sciences*) softverske aplikacije, uz primenu deskriptivne statistike (učestalost ispitanika prema kategoriji arterijskog krvnog pritiska) i inferencijalne statistike za testiranje hipoteza. Razlike među grupama su ispitane korišćenjem Fisherov test tačne verovatnoće, uz pouzdanost od 95% i pragom statističke značajnost od $p < 0,05$. Rezultati su prikazani tekstualno i tabelarno.

REZULTATI

U istraživanju je učestvovalo 57 ispitanika oba pola, od kojih 30 (52,6%) žena i 27 (47,4%) muškaraca, prosečne starosti 36,37 ± 4,35 godina.

Starosna struktura ispitanika je bila sledeća: u kategoriji 18 – 30 godina bilo je 20 ispitanika (35,1%); u kategoriji 31 – 45 godina bilo je 25 ispitanika (43,8%); u kategoriji 46 – 60 godina bilo je 11 ispitanika (19,3%); dok je jedan ispitanik (1,7%) imao više od 60 godina.

Struktura ispitanika prema kategoriji AKP-a, u celoj ispitivanoj grupi, prikazana je u Tabeli 1.

Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja piva prikazane su u Tabeli 2.

Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja belog vina prikazane su u Tabeli 3.

Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja crnog vina prikazane su u Tabeli 4.

(groups) of respondents were defined – risky drinkers and non-risky drinkers, for each type of alcoholic beverage separately, as well as for all alcoholic beverages in total. Respondents who indicated that they consumed alcohol once a week or less were categorized as non-risky, while those who drank more than once a week were categorized as risky.

ABP was measured in keeping with the recommended procedure for routine measuring of blood pressure, in the doctor's office, under standardized conditions, and in keeping with the ESC/ESH recommendations from 2018 [16]. In all 57 subjects, arterial blood pressure was measured with an analog sphygmomanometer. Before ABP was measured, subjects were placed in a quiet environment for five minutes. ABP was measured on both upper arms using the appropriate cuff size in relation to upper arm circumference (ABP was measured on both arms to detect possible differences between them, the arm with the higher value was taken as the reference). Three ABP measurements were recorded and were spaced 1 – 2 minutes apart. The last two measurements were taken for the average ABP value. The ABP stage was determined for each subject, according to the accepted criteria for hypertension (≥ 140/90 mmHg). When ABP was measured in the doctor's office, the categories (groups) of subjects were determined – the category of those with hypertension and those without hypertension. The classification of the level of ABP was determined in keeping with the ESC/ESH recommendations from 2018 [16].

The data were processed using SPSS (Statistical Package for Social Sciences) software, with the application of descriptive statistics (frequency of subjects according to arterial blood pressure category) and inferential statistics for hypothesis testing. Differences between groups were examined using the Fisher's exact test, with a confidence level of 95% and a statistical significance threshold of $p < 0.05$. The results are presented in textual and tabular form.

RESULTS

The study involved 57 subjects of both sexes, of whom 30 (52.6%) women and 27 (47.4%) men, of the average age 36.37 ± 4.35 years.

The age structure of the respondents was as follows: in the 18 – 30 years category there were 20 respondents (35.1%); in the 31 – 45 years category there were 25 respondents (43.8%); in the 46 – 60 years category there were 11 respondents (19.3%); while one respondent (1.7%) was over 60 years old.

Respondent structure according to the category of ABP in the entire examined group is presented in Table 1.

Tabela 1. Struktura ispitanika prema kategoriji arterijskog krvnog pritiska

Table 1. Respondent structure according to the category of arterial blood pressure

KATEGORIJA ARTERIJSKOG KRVNOG PRITISKA / *CATEGORY OF ARTERIAL BLOOD PRESSURE*	**Broj ispitanika / *Number of respondents* (n)**	**Procenat / *Percentage* (%)**
Optimalan krvni pritisak / *Optimal blood pressure*	16	28,1%
Normalan krvni pritisak / *Normal blood pressure*	14	24,6%
Gornja granica normalnog krvnog pritiska / *Upper limit of normal blood pressure*	13	22,8%
Hipertenzija stadijum I / *Hypertension stage I*	13	22,8%
Hipertenzija stadijum II / *Hypertension stage II*	1	1,8%
UKUPNO / *TOTAL*	57	100%

* Kategorija arterijskog krvnog pritiska prema klasifikaciji Evropskog udruženja kardiologa i preporukama ESC-a/ESH-a za lečenje arterijske hipertenzije iz 2018. godine [17].

* Category of arterial blood pressure according to the classification of the European Society of Cardiology and the ESC/ESH recommendations for the treatment of arterial hypertension, from 2018 [17].

U ispitivanoj grupi je bilo najviše, odnosno 16 (28,1%) ispitanika sa optimalnim krvnim pritiskom (do 120/80 mmHg), nešto manje ispitanika je bilo sa normalnim i graničnim krvnim pritiskom, sa hipertenzijom I stepena (140 – 159/90-99 mmHg) je bilo 13 (22,8%) ispitanika, dok je samo jedan ispitanik imao hipertenziju II stepena (160 – 179/100 – 109 mmHg).

In the examined group, there largest number of subjects, i.e., 16 (28.1%) of them had optimal blood pressure (up to 120/80 mmHg), a slightly smaller number of subjects had normal and borderline blood pressure, there were 13 (22.8%) subjects with stage one hypertension (140 – 159/90 – 99 mmHg), while only one subject had stage two hypertension (160 – 179/100 – 109 mmHg).

Tabela 2. Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja piva

Table 2. Differences between the number of respondents with hypertension/without hypertension and the frequency of beer consumption

Frekvencija konzumiranja piva / *Frequency of beer consumption*	**Broj ispitanika (%) / *Number of respondents (%)***		***p***
	Nema hipertenziju / *Without hypertension*	**Ima hipertenziju / *With hypertension***	
Nije rizično / *Non-risky*	40 (70.2)	13 (22.8)	
Rizično / *Risky*	3 (5.3)	1 (1.8)	1.000
UKUPNO / *TOTAL*	43 (75.4)	14 (24.6)	

Od 57 ispitanika koji su konzumirali pivo, 43 (75,4%) ispitanika nije imalo hipertenziju, dok je 14 (24,6%) ispitanika imalo hipertenziju. Od 53 ispitanika koji nisu rizično konzumirali pivo, 40 (70,2%) ispitanika nije imalo hipertenziju, dok je hipertenziju imalo 13 (22,8%) ispitanika. Od 4 ispitanika koji su rizično konzumirali pivo, 3 (5,3%) ispitanika nije imalo hipertenziju, dok je 1 (1,8%) ispitanik imao hipertenziju.
Ne postoji statistički značajna razlika u prisustvu hipertenzije u odnosu na frekvenciju konzumiranja piva (p>0,05).

Of the 57 respondents who consumed beer, 43 (75.4%) subjects did not have hypertension, while 14 (24.6%) subjects had hypertension. Of the 53 respondents who were non-risky beer drinkers, 40 (70.2%) subjects did not have hypertension, while 13 (22.8%) subjects had hypertension. Of the four respondents who were risky beer drinkers, three (5.3%) subjects did not have hypertension, while one (1.8%) subject had hypertension.
There is no statistically significant difference regarding the presence of hypertension in relation to the frequency of beer consumption ($p > 0.05$)

Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja žestokih pića prikazane su u Tabeli 5.

The differences between the number of respondents with hypertension/without hypertension and the frequency of beer consumption are presented in Table 2.

Tabela 3. Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja belog vina

Table 3. Differences between the number of respondents with hypertension/without hypertension and the frequency of white wine consumption

Frekvencija konzumiranja belog vina / *Frequency of white wine consumption*	**Broj ispitanika (%) / *Number of respondents (%)***		***p***
	Nema hipertenziju / *Without hypertension*	**Ima hipertenziju / *With hypertension***	
Nije rizično / *Non-risky*	39 (68,4)	14 (24,6)	
Rizično / *Risky*	4 (7,0)	0 (0,0)	0,563
UKUPNO / *TOTAL*	43 (75,4)	14 (24,6)	

Od 57 ispitanika koji su konzumirali belo vino, 43 (75,4%) ispitanika nije imalo hipertenziju, dok je 14 (24,6%) ispitanika imalo hipertenziju. Od 53 ispitanika koji nisu rizično konzumirali belo vino, 39 (68,4%) ispitanika nije imalo hipertenziju, dok je 14 (24,6%) ispitanika imalo hipertenziju. Od četiri (7,0%) ispitanika koji su rizično konzumirali belo vino, nijedan ispitanik nije imalo hipertenziju.
Ne postoji statistički značajna razlika u pogledu prisustva hipertenzije u odnosu na frekvenciju konzumiranja belog vina ($p > 0,05$)

Of the 57 respondents who consumed white wine, 43 (75.4%) subjects did not have hypertension, while 14 (24.6%) subjects had hypertension. Of the 53 respondents who were non-risky white wine drinkers, 39 (68.4%) subjects did not have hypertension, while 14 (24.6%) subjects had hypertension. Of the four (7.0%) subjects who were risky white wine drinkers, none of the subjects had hypertension.
There is no statistically significant difference regarding the presence of hypertension in relation to the frequency of white wine consumption ($p > 0.05$).

Tabela 4. Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja crnog vina

Table 4. Differences between the number of respondents with hypertension/without hypertension and the frequency of red wine consumption

Frekvencija konzumiranja crnog vina / *Frequency of red wine consumption*	**Broj ispitanika (%) / *Number of respondents (%)***		***p***
	Nema hipertenziju / *Without hypertension*	**Ima hipertenziju / *With hypertension***	
Nije rizično / *Non-risky*	42 (73,7)	14 (24,6)	
Rizično / *Risky*	1 (1,8)	0 (0,0)	1,000
UKUPNO / *TOTAL*	43 (75,4)	14 (24,6)	

Od 57 ispitanika koji su konzumirali crno vino, 43 (75,4%) ispitanika nije imalo hipertenziju, dok je 14 (24,6%) ispitanika imalo hipertenziju. Od 56 ispitanika koji nisu rizično konzumirali crno vino, 42 (73,7%) ispitanika nije imalo hipertenziju, dok je 14 (24,6%) ispitanika imalo hipertenziju. Hipertenziju nije imao jedan (1,8%) ispitanik koji je rizično konzumirao crno vino.
Ne postoji statistički značajna razlika u pogledu prisustva hipertenzije u odnosu na frekvenciju konzumiranja crnog vina ($p > 0,05$)

Of the 57 respondents who consumed red wine, 43 (75.4%) subjects did not have hypertension, while 14 (24.6%) subjects had hypertension. Of the 56 subjects who were non-risky red wine drinkers, 42 (73.7%) subjects did not have hypertension, while 14 (24.6%) subjects had hypertension. The one (1.8%) respondent who was a risky red wine drinker did not have hypertension.
There is no statistically significant difference regarding the presence of hypertension in relation to the frequency of red wine consumption ($p > 0.05$).

Tabela 5. Razlike između broja ispitanika sa hipertenzijom/bez hipertenzije i frekvencije konzumiranja žestokih pića

Table 5. Differences between the number of respondents with hypertension/without hypertension and the frequency of hard liquor (spirits) consumption

Frekvencija konzumiranja žestokih pića / *Frequency of consuming hard liquor (spirits)*	**Broj ispitanika (%) / *Number of respondents (%)***		***p***
	Nema hipertenziju / *Without hypertension*	**Ima hipertenziju / *With hypertension***	
Nije rizično / *Non-risky*	40 (70,2)	14 (24,6)	
Rizično / *Risky*	3 (5,3)	0 (0,0)	0,568
UKUPNO / *TOTAL*	43 (75,4)	14 (24,6)	

Od 57 ispitanika koji su konzumirali žestoka pića, 43 (75,4%) ispitanika nije imalo hipertenziju, dok je 14 (24,6%) ispitanika imalo hipertenziju. Od 54 ispitanika koji nisu rizično konzumirali žestoka pića, 40 (70,2%) ispitanika nije imalo hipertenziju, dok je 14 (24,6%) ispitanika imalo hipertenziju. Od tri (5,3%) ispitanika koji su rizično konzumirali žestoka pića, nijedan nije imao hipertenziju.
Ne postoji statistički značajna razlika u pogledu prisustva hipertenzije u odnosu na frekvenciju konzumiranja žestokih pića ($p > 0,05$)

Of the 57 respondents who consumed spirits, 43 (75.4%) subjects did not have hypertension, while 14 (24.6%) subjects had hypertension. Of the 54 respondents who were non-risky spirits drinkers, 40 (70.2%) subjects did not have hypertension, while 14 (24.6%) subjects had hypertension. Of the three (5.3%) respondents who were risky spirits drinkers, none had hypertension.
There is no statistically significant difference regarding the presence of hypertension in relation to the frequency of spirits consumption ($p > 0.05$).

Tabela 6. Povezanost konzumiranja alkoholnih pića sa arterijskom hipertenzijom

Table 6. Association between the consumption of alcoholic beverages and arterial hypertension

Frekvencija konzumiranja alkoholnih pića / *Frequency of the consumption of alcoholic beverages*	**Broj ispitanika (%) / *Number of respondents (%)***		***p***
	Nema hipertenziju / *Without hypertension*	**Ima hipertenziju/ *With hypertension***	
Nije rizično / *Non-risky*	35 (81,4)	8 (18,6)	
Rizično / *Risky*	13 (92,9)	1 (7,1)	0,427
UKUPNO / *TOTAL*	48 (84,2)	9 (15,8)	

Od 57 ispitanika koji su konzumirali alkoholna pića, 48 (84,2%) ispitanika nije imalo hipertenziju, dok je 9 (15,8%) ispitanika imalo hipertenziju. Od 43 ispitanika koji nisu rizično konzumirali alkoholna pića, 35 (81,4%) ispitanika nije imalo hipertenziju, dok je 8 (18,6%) ispitanika imalo hipertenziju. Od 14 ispitanika koji su rizično konzumirali alkoholna pića, 13 (92,9%) ispitanika nije imalo hipertenziju, dok je jedan (7,1%) ispitanik imao hipertenziju.
Ne postoji statistički značajna razlika u pogledu prisustva hipertenzije u odnosu na frekvenciju konzumiranja alkoholnih pića ($p > 0,05$).

Of the 57 respondents who consumed alcoholic beverages, 48 (84.2%) subjects did not have hypertension, while 9 (15.8%) subjects had hypertension. Of the 43 respondents who were non-risky drinkers of alcoholic beverages, 35 (81.4%) subjects did not have hypertension, while 8 (18.6%) subjects had hypertension. Of the 14 respondents who were risky drinkers of alcoholic beverages, 13 (92.9%) subjects did not have hypertension, while one (7.1%) subject had hypertension.
There is no statistically significant difference regarding the presence of hypertension in relation to the frequency of the consumption of alcoholic beverages ($p > 0.05$).

Pored toga, ispitali smo i povezanost hipertenzije u odnosu na frekvenciju konzumiranja svih pića, tako što smo sve ispitanike grupisali na one koji nerizično i one koji rizično piju sva alkoholna pića, i rezultate prikazali u Tabeli 6 .

Od 57 ispitanika koji su konzumirali alkoholna pića, 48 (84,2%) ispitanika nije imalo hipertenziju, dok je 9 (15,8%) ispitanika imalo hipertenziju. Od 43 ispitanika koji nisu rizično konzumirali alkoholna pića, 35 (81,4%) ispitanika nije imalo hipertenziju, dok je 8 (18,6%) ispitanika imalo hipertenziju. Od 14 ispitanika koji su rizično konzumirali alkoholna pića, 13 (92,9%) ispitanika nije imalo hipertenziju, dok je jedan (7,1%) ispitanik imao hipertenziju.

Ne postoji statistički značajna razlika u pogledu prisustva hipertenzije u odnosu na frekvenciju konzumiranja alkoholnih pića ($p > 0,05$).

Povezanost hipertenzije i konzumiranja alkoholnih pića proverena je i Spirmanovim koeficijentom korelacije, koji je pokazao da ne postoji statistički značajna korelacija između prisustva hipertenzije i konzumiranja alkoholnih pića (ρ = -0,135, bez značajnosti).

DISKUSIJA

Ovo istraživanje je imalo za cilj da utvrdi da li postoji statistički značajna povezanost između konzumiranja alkohola i hipertenzije, kod ispitanika u Srbiji. U istraživanju je učestvovalo 57 ispitanika oba pola sa prosečnom starošću od 36,37 ± 4,35 godina. U ispitivanoj grupi je bilo najviše 16 (28,1%) ispitanika sa optimalnim krvnim pritiskom (do 120/80 mmHg), nešto manje sa normalnim i graničnim pritiskom, dok je sa hipertenzijom I stepena (140 – 159/90 – 99 mmHg) bilo 13 (22,8%) ispitanika, a samo jedan ispitanik sa hi-

The differences between the number of respondents with hypertension/without hypertension and the frequency of white wine consumption are presented in Table 3.

The differences between the number of participants with hypertension/without hypertension and the frequency of red wine consumption are presented in Table 4.

The differences between the number of respondents with hypertension/without hypertension and the frequency of hard liquor (spirits) consumption are presented in Table 5.

In addition, we examined the relationship between hypertension and the frequency of the consumption of all alcoholic beverages, by grouping all respondents into non-risky drinkers of all alcoholic beverages and risky drinkers of all alcoholic beverages, and we have presented these results in Table 6 .

Of the 57 respondents who consumed alcoholic beverages, 48 (84.2%) subjects did not have hypertension, while 9 (15.8%) subjects had hypertension. Of the 43 respondents who were non-risky drinkers of alcoholic beverages, 35 (81.4%) subjects did not have hypertension, while 8 (18.6%) subjects had hypertension. Of the 14 respondents who were risky drinkers of alcoholic beverages, 13 (92.9%) subjects did not have hypertension, while one (7.1%) subject had hypertension.

There is no statistically significant difference regarding the presence of hypertension in relation to the frequency of the consumption of alcoholic beverages ($p > 0.05$).

The relationship between hypertension and the consumption of alcoholic beverages was also verified by the Spearman's correlation coefficient, which showed that

pertenzijom II stepena (160 – 179/100 – 109 mmHg). Većina ispitanika (43) konzumirala je umerenu količinu alkoholnih pića (manje od jednom nedeljno), pri čemu su procenti hipertenzije bili slični u svim kategorijama konzumiranja alkohola.

Rezultati su pokazali da u ovom uzorku ispitanika nije pronađena statistički značajna povezanost između hipertenzije i frekvencije konzumiranja alkohola (piva, belog vina, crnog vina i žestokih pića).

Važno je napomenuti da ovi rezultati važe samo za ovaj uzorak ispitanika i da bi bilo potrebno sprovesti dalja istraživanja na većem uzorku kako bi se potvrdili ovi nalazi.

Brojne studije su se bavile ovom temom. Većina studija sugeriše da konzumiranje visokih doza alkohola vodi ka povišenju AKP-a, ali odnos između laganog do umerenog konzumiranja alkohola ostaje kontroverzan [17]. Pregled više desetina longitudinalnih studija utvrdio je da maksimalno jedno alkoholno piće dnevno može biti povezano sa smanjenim rizikom od određenih kardiovaskularnih bolesti, u poređenju sa apstinencijom od alkohola [18]. Neki drugi pregledi longitudinalnih studija govore da samo neke kategorije populacije imaju koristi od konzumiranja alkohola. Kod žena, koje konzumiraju maksimalno 5 g alkohola dnevno, primetan je blagi zaštitni efekat u prevenciji hipertenzije. Međutim, kod muškaraca postoji linearna veza između konzumiranja alkohola i hipertenzije, čak i pri minimalnim dozama, posebno kod muškaraca azijskog porekla [19].

Tokom protekle decenije, u Srbiji je utvrđeno da je više od polovine smrtnih slučajeva bilo zbog kardiovaskularnih insulta, čemu hipertenzija značajno doprinosi. Međutim, nije utvrđena povezanost između konzumiranja alkohola, odnosno njegovih pojedinih vrsta (rakija, pivo, vino), i nastanka i učestalosti hipertenzije [20].

ZAKLJUČAK

U ovom istraživanju nije pronađena statistički značajna povezanost između konzumiranja alkoholnih pića (piva, belog vina, crnog vina i žestokih alkoholnih pića) i arterijske hipertenzije, kod ispitanika oba pola starijih od 18 godina koji nisu bili na antihipertenzivnoj terapiji.

Preporuka za dalja istraživanja je da se stvore uslovi za longitudinalne studije, kako bi se dobili podaci o uticaju alkohola na visinu arterijskog krvnog pritiska.

SPISAK SKRAĆENICA

SAD – Sjedinjene Američke Države
ESC – Evropsko udruženje kardiologa (engl. *European Society of Cardiology*)

there is no statistically significant correlation between the presence of hypertension and the consumption of alcoholic beverages (ρ = -0.135, without significance).

DISCUSSION

The aim of this study was to determine whether there is a statistically significant association between alcohol consumption and hypertension among respondents in Serbia. A total of 57 respondents of both sexes and of the average age of 36.37 ± 4.35 years participated in the study. In the examined group, there were most, i.e., 16 (28.1%) subjects with optimal blood pressure (up to 120/80 mmHg), there was a slightly smaller number of those with normal and borderline blood pressure, while there were 13 (22.8%) respondents with stage one hypertension (140 – 159/90 – 99 mmHg), and only one respondent with stage two hypertension (160 – 179/100 – 109 mmHg). Most of the respondents (43) consumed a moderate quantity of alcoholic beverages (less than once a week), while the percentages of hypertension were similar in all categories of alcohol consumption.

The results showed that, in this sample of respondents, no statistically significant association was found between hypertension and the frequency of alcohol consumption (beer, white wine, red wine, and spirits).

It is important to note that these results only apply to this sample of respondents and that further research on a larger sample would be necessary to confirm these findings.

Numerous studies have addressed this topic. Most studies suggest that high-dose alcohol consumption leads to elevated ABP, but the relationship between light to moderate alcohol consumption remains controversial [17]. A review of dozens of longitudinal studies found that a maximum of one alcoholic drink per day may be associated with a reduced risk of certain cardiovascular diseases, compared to abstinence from alcohol [18]. Some other reviews of longitudinal studies suggest that only some categories of the population benefit from alcohol consumption. In women, who consume a maximum of 5 g of alcohol per day, a slight protective effect is noticeable in the prevention of hypertension. However, in men there is a linear relationship between alcohol consumption and hypertension, even at minimal doses, especially in Asian men [19].

During the previous decade, it has been established that more than half of the deaths in Serbia were the result of cardiovascular insults, to which hypertension contributes significantly. However, no association has been established between the consumption of alcohol, i.e., its individual types (brandy, beer, wine), and the presence and frequency of hypertension [20].

ESH – Evropsko udruženje za hipertenziju (engl. *European Society of Hypertension*)
SPSS – Statistički paket za društvene nauke (engl. *Statistical Package for Social Sciences*)
AKP – arterijski krvni pritisak
SZO – Svetska zdravstvena organizacija

Sukob interesa: Nije prijavljen.

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CONCLUSION

In this study, no statistically significant association was found between the consumption of alcoholic beverages (beer, white wine, red wine, and spirits) and arterial hypertension, in subjects of both sexes, over 18 years of age, who were not on antihypertensive therapy.

The recommendation for further research is to create the conditions for longitudinal studies, in order to obtain data on the influence of alcohol on arterial blood pressure.

LIST OF ABBREVIATIONS/ACRONYMS

USA – United States of America
ESC – European Society of Cardiology
ESH – European Society of Hypertension
SPSS – Statistical Package for Social Sciences
ABP – arterial blood pressure
WHO – World Health Organization

Conflict of interest: None declared.

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