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Broj: 884/7-1
Podgorica, 18.06.2024. godine

Univerzitet Crne Gore
Odbor za doktorske studije
n/r predsjedniku – prof. dr Borisu Vukićeviću

Poštovani,

U skladu sa članom 41 i 55 Pravila doktorskih studija, i tačkom 8. Vodiča za doktorske studije, u prilogu akta dostavljamo obrazac D2 uz Predlog Odluke Vijeća o imenovanju Komisije za ocjenu doktorske disertacije dr med Mirjane Nedović Vuković, pod nazivom „Primjena regresionih metoda u analizi trenda umiranja od malignih neoplazmi u Crnoj Gori, 1990-2018. godine" sa pratećom dokumentacijom.

S poštovanjem.

MEDICINSKI FAKULTET
D E K A N,
Prof. dr Miodrag Radunović

ISPUNJENOST USLOVA DOKTORANDA

OPŠTI PODACI O DOKTORANDU			
Titula, ime, ime roditelja, prezime	dr med. Mirjana (Mijat) Nedović Vuković		
Fakultet	Medicinski fakultet Podgorica		
Studijski program	Medicina		
Broj indeksa	4/09		
NAZIV DOKTORSKE DISERTACIJE			
Na službenom jeziku	Primjena regresionih modela u analizi trenda umiranja od malignih neoplazmi u Crnoj Gori ,1990-2018. godine		
Na engleskom jeziku	Application of regression models in the mortality trend analysis from malignant neoplasms in Montenegro, 1990-2018		
Naučna oblast	Medicina, medicinska statistika i informatika		
MENTOR/MENTORI			
Prvi mentor	Prof. dr Zoran Bukumirić	Medicinski fakultet Univerziteta u Beogradu	Medicinska statistika i informatika
Drugi mentor	Prof. dr Dragan Laušević	Medicinski fakultet Univerziteta Crne Gore	Epidemiologija
KOMISIJA ZA PREGLED I OCJENU DOKTORSKE DISERTACIJE			
prof. dr Mileta Golubović		Medicinski fakultet Univerziteta Crne Gore	Patologija
prof. dr Zoran Bukumirić		Medicinski fakultet Univerziteta u Beogradu	Medicinska statistika i informatika
prof. dr Dragan Laušević		Medicinski fakultet Univerziteta Crne Gore	Epidemiologija
Prof.dr Milica Martinović		Medicinski fakultet Univerziteta Crne Gore	Patološka fiziologija
Doc.dr Tanja Boljević		Medicinski fakultet Univerziteta Crne Gore	Hirurgija

Datum značajni za ocjenu doktorske disertacije	
Sjednica Senata na kojoj je data saglasnost na ocjenu temu i kandidata	21.01.2021. godine
Dostavljanja doktorske disertacije organizacionoj jedinici i saglasanost mentora	30.04.2024. godine
Sjednica Vijeća organizacione jedinice na kojoj je dat predlog za imenovanje komisija za pregled i ocjenu doktorske disertacije	14.06.2024. godine

ISPUNJENOST USLOVA DOKTORANDA

U skladu sa članom 38 Pravila doktorskih studija kandidat **je** dio sopstvenih istraživanja vezanih za doktorsku disertaciju publikovao u časopisu sa **(SCI/SCIE)/(SSCI/A&HCI)** liste kao prvi autor.

Spisak radova doktoranda iz oblasti doktorskih studija koje je publikovao u časopisima sa SCI /SCIE .

1. **Nedović-Vukovic M**, Laušević D, Vučković L, Bukumirić Z. Trend of breast cancer mortality in Montenegro, 1990-2018 - Joinpoint regression. Eur Rev Med Pharmacol Sci. 2022 Jun;26(11):3849-3857. doi: 10.26355/eurrev_202206_28952. ISSN: 1128-3602.
2. **Nedović Vukovic M**, Jakšić M, Smolović B, Lukić M, Bukumirić Z. Trends in gastric cancer mortality in Montenegro, 1990 - 2018: joinpoint regression. Oncology. 2024 Feb 19. doi: 10.1159/000537739.
3. **Nedović Vukovic M,** Jakšić M, Stojanović D, Smolović B. Time trends in liver cancer mortality rates in Montenegro from 1990 to 2018. Eur J Gastroenterol Hepatol. 2024 May 1;36(5):622-627. doi: 10.1097/MEG.0000000000002736
4. **Nedovic Vukovic M,** Terzic Z, Golubovic M, Bojic M, Bukumiric Z. Skin Melanoma Mortality Trend in Montenegro for the period of 1990-2018. Eur Rev Med Pharmacol Sci. 2024;28(9):3463-3472. doi: 10.26355/eurrev_202405_36192.
5. **Nedovic Vukovic M,** Jaksic M, Smolovic B, Lukic M, Bukumiric Z. Trends in esophageal cancer mortality in Montenegro, 1990 – 2018. European Journal of Public Health. 2024;, ckae080, https://doi.org/10.1093/eurpub/ckae080

Obrazloženje mentora o korišćenju doktorske disertacije u publikovanim radovima

Dio istraživačkog materijala, koji proističe iz doktorske disertacije, publikovan je u vidu pet radova u toku 2022 i 2024. godine u renomiranim međunarodnim časopisima:
„European Review for Medical and Pharmacological Sciences“ (indeksiran u SCI, impakt faktor 3.5)
„Oncology“ (indeksiran u SCI, impakt faktor 3.3)
„European Journal of Gastroenterology and Hepatology“ (indeksiran u SCI, impakt faktor 2.1)
„European Journal of Public Health“ (indeksiran u SCI, impakt faktor 4.4)

U pomenutim publikacijama je ispitivan trend smrtnosti od različitih vrsta malignih tumora uključujući dojku, želudac, jetru, jednjak i melanom, za ukupan nivo, po polu i po starosnim grupama. Analizirajući ove trendove, moguće je procijeniti opterećenje koje karcinomi

predstavljaju za društvo te obezbijediti osnovna usmjerenja za razvoj strategija prevencije i alociranje javnozdravstvenih resursa. Razumijevanje ovih trendova pomaže donosiocima politika da donesu odluke utemeljene na dokazima, usmjere resurse prema ključnim područjima, razviju javnozdravstvenu politiku s fokusom na ključnu populaciju, te unaprijede dijagnozu i liječenje, s ciljem smanjenja smrtnosti od karcinoma. Rezultati ovih istraživanja su od velikog epidemiološkog značaja jer pružaju informacije bitne za dugoročno planiranje svih aktivnosti nadzora nad malignim tumorima.
Datum i ovjera (pečat i potpis odgovorne osobe)
U Podgorici, (14.06.2024) DEKAN prof. dr Miodrag Radunović MP

Prilog dokumenta sadrži:

1. Potvrdu o predaji doktorske disertacije organizacionoj jedinici
2. Odluku o imenovanju komisije za pregled i ocjenu doktorske disertacije
3. Kopiju rada publikovanog u časopisu sa odgovarajuće liste
4. Biografiju i bibliografiju kandidata
5. Biografiju i bibliografiju članova komisije za pregled i ocjenu doktorske disertacije sa potvrdom o izboru u odgovarajuće akademsko zvanje i potvrdom da barem jedan član komisije nije u radnom odnosu na Univerzitetu Crne Gore

UNIVERZITET CRNE GORE

MEDICINSKI FAKLTET

Broj: 682/1

Podgorica 30.04.2024. godine

P O T V R D A

Potvrđuje se da je dr med Mirjana Nedović Vuković , predala 7 primjeraka doktorske disertacije, pod nazivom **„Primjena regresionih modela u analizi trenda umiranja od malignih neoplazmi u Crnoj Gori,1990-2018.godine“ dana 30.04.2024**.godine (Broj protokola 682) .

Potvrda se izdaje u svrhu pregleda i ocjene doktorske disrtacije.

ŠEF STUDENTSKE SLUŽBE

Sonja Vukićević

Sonja Vukićević,diplomirani pravnik

UNIVERZITET CRNE GORE
MEDICINSKI FAKULTET
Broj: 884/7
Podgorica, 14.06.2024. godine

Na osnovu člana 64 stav 1 tačka 9 Statuta Univerziteta Crne Gore, (Bilten UCG br.337/2015 i br 447/2018), člana 41 i 55 Pravila doktorskih studija, inicijalnog predloga Komisije za doktorske studije Medicinskog fakulteta broj: 682/2 od 17.05.2024. godine i tačke 3.8 Vodiča za doktorske studije Univerziteta Crne Gore, Vijeće Medicinskog fakulteta na elektronskoj sjednici održanoj 13-14.06.2024. godine, donijelo je

O D L U K U

I

Kandidat dr med Mirjana Nedović Vuković, ispunjava formalne uslove za ocjenu doktorske disertacije: **„Primjena regresionih metoda u analizi trenda umiranja od malignih neoplazmi u Crnoj Gori, 1990-2018. godine".**

II

Predlaže se Komisija za ocjenu doktorske disertacije dr med Mirjane Nedović Vuković, pod navedenim nazivom: **„Primjena regresionih metoda u analizi trenda umiranja od malignih neoplazmi u Crnoj Gori, 1990-2018. godine"** u sastavu:

1. **Prof. dr Mileta Golubović**, redovni profesor Medicinskog fakulteta Univerziteta Crne Gore, naučna oblast: patologija;
2. **Prof. dr Zoran Bukumirić**, vanredni profesor Medicinskog fakulteta Univerziteta u Beogradu, naučna oblast: medicinska statistika i informatika;
3. **Prof. dr Dragan Laušević**, redovni profesor Medicinskog fakulteta Univerziteta Crne Gore, naučna oblast: epidemiolog;
4. **Prof. dr Milica Martinović**, redovna profesorica Medicinskog fakulteta Univerziteta Crne Gore, naučna oblast: patološka fiziologija;
5. **Doc. dr Tanja Boljević**, docentkinja Medicinskog fakulteta Univerziteta Crne Gore, naučna oblast: maksilofacijalna hirurgija;

III

Komisija za ocjenu doktorske disertacije je dužna da Vijeću Medicinskog fakulteta, podnese izvještaj koji sadrži ocjenu doktorske disertacije.

Obrazloženje

Dr med Mirjana Nedović Vuković je predala doktorsku disertaciju pod nazivom: **Primjena regresionih metoda u analizi trenda umiranja od malignih neoplazmi u Crnoj Gori, 1990-2018. godine"** dana 30.04.2024. godine.

Vijeće Medicinskog fakulteta je utvrdilo da kandidat ispunjava uslove iz člana 38 Pravila doktorskih studija, da kandidat dr med Mirjana Nedović Vuković ima, kao prvi autor više radova sa rezultatima iz teze objavljenih u časopisu sa SCI/**SCIE** liste. Samim tim su se stekli uslovi da se imenuje Komisija za ocjenu pomenute doktorske disertacije. Na osnovu svega navedenog, odlučeno je kao u dispozitivu ove Odluke.

VIJEĆE MEDICINSKOG FAKULTETA
PREDSJEDAVAJUĆI,

Prof. dr Miodrag Radunović, dekan

European Review for Medical and Pharmacological Sciences 2022; 26: 3849-3857

Trend of breast cancer mortality in Montenegro, 1990-2018 – Joinpoint regression

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Abstract. – OBJECTIVE: In this study, we analyzed breast cancer mortality data overall and by age groups in women in Montenegro, to determine if there were any changes in trend for period 1990-2018.

MATERIALS AND METHODS: The study gathered data on breast cancer mortality in Montenegro obtained from Vital Registration System. Annual data on breast cancer mortality were extracted for period 1990-2018 and analyzed using World Standard Population age-standardized and age-specific rates and Joinpoint regression.

RESULTS: In 2018 in Montenegro, breast cancer accounted for 4.64% of all deaths in women and for 19.78% of all cancer deaths in women. In terms of total cancer mortality, it ranked first among women. Age-standardized rates ranged from 11.41/100,000 in 1990 to 20.46/100,000 in 2016. Joinpoint regression showed no one joinpoint for the entire population of all women and age groups. In the observed period, breast cancer mortality rates significantly increased in the women in Montenegro [average annual percentage change (AAPC) = 1.44%; 95% confidence interval (CI): 0.9-2.0]. The most affected age group was 55-64 years.

CONCLUSIONS: There is a growing breast cancer mortality trend in Montenegro. It is necessary to create specific programs for urgent action, in order to reduce this undesirable trend. At the same time, support from the competent institutions is needed for increasing screening coverage and better prevention of breast cancer in the target population.

Key Words:
Trend, Mortality, Breast cancer, Montenegro.

Introduction

Breast cancer is the leading cause of death in women in many countries worlwide[1,2]. With nearly 700,000 deaths globally, it accounts for 1 in 6 cancer deaths. It ranks as the fifth in the world for cancer deaths[1], with a share of 30% in relation to all cancer in women[2]. Its mortality rate is 17% higher in developing than in developed countries[1,2]. Taking into account the period from 1990 to the present, there has been a global increase in breast cancer mortality in most age groups and regions[3-5]. Despite favorable mortality trends in some developed countries, breast cancer remains a major public health problem[5,6]. Looking at the European region, there has been a decline in breast cancer mortality with less favorable trends in transition countries[7-9].

Breast cancer in women is considered as a multietiological disease. It is difficult to understand the contribution of each individual risk factor identified so far[6]. Most risk factors could be addressed through health education, as well as public health initiatives[5,6]. In general, the most important factors influencing cancer mortality rates are appropriate screening, diagnosis, and treatment of cancers[10,11]. In the field of breast cancer screening, the World Health Organization recommends population-based mammograms every second year for women with an average risk between 50 and 69 years of age in good health system resources[12]. The women who had mammography examinations increased their five-year relative survival rate to 90%[13]. The latest systematic review[14] for Europe has shown that organized mammography breast cancer screening has led to a mortality decrease in the European region.

In Montenegro, breast cancer is the most common cancer in women and is also the leading cause of cancer deaths[15,16]. Out of the total number of women's deaths becuase of breast cancer, 58.9%. were under 65 years of age and 81.1%

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were under 75 years of age[15]. 1 out of 5 women cancer deaths was caused by a breast cancer[16]. Montenegro recognizes cancer as a major public health problem[15,17]. A more intensive health policy, aimed at combating breast cancer, has been implemented in recent years with the adoption of the National Breast Cancer Early Detection Program 2010[18] and the National Cancer Program 2011[19]. The National Breast Cancer Early Detection Program[18] aims to raise awareness, to identify early signs and symptoms of the disease and to ensure a high percentage of women in the screening program (minimum 70%). The Program also obligate to provide adequate diagnosis and treatment for women with positive/suspicious findings. One of the goals of the Program was to reduce the mortality of women from breast cancer by 15% in the period of 5 years after the Program's implementation. The breast cancer screening in Montenegro began on 23 December 2015, in four municipalities: Podgorica, Danilovgrad, Cetinje and Kolašin. The screening was conducted among women, insurees of the Health Insurance Fund of Montenegro, aged 50-69. The screening cycle lasts two years and the screening test is a digital mammography.

In order to better monitor cancer diseases, in accordance with the National Cancer Program[19], a National Cancer Registry was established on 1 January 2013. Cancer surveillance is crucial for making and implementating health care policies aimed at prevention and control of diseases. Without data collection and analysis, there is no adequate assessment whether the set goal is achieved or not[16,20,21].

Trend variations reporting of breast cancer helps policymakers to measure its burden, to design health services infrastructure and allocate public health resources[4,5]. The study of the breast cancer epidemiological trend is partially measurable as highly preventable, in combination with primary and secondary preventive activities[5,22,23].

In this study, we analyzed breast cancer mortality data, overall and by age groups, in women in Montenegro in order to determine if there were any changes in trends for the period between 1990 and 2018.

Materials and Methods

Data Sources

The study gathered data on breast cancer mortality among women in Montenegro, obtained from Vital Registration System, which was first under control of the Statistical Office of Montenegro until 2009, and then under the Institute for Public Health. The personal data of the respondents were protected in accordance with the Law on Personal Data Protection ("Official Gazette of Montenegro", No. 079/08 12/2008, No. 070/09 10/2009, No. 044/12 08/2012, No. 022/17 04/2017) and General Data Protection Regulation (Data Protection Act 2018, c.). The estimated number of people, which we used for calculating mortality rate, was obtained from the website of the Statistical Office of Montenegro (https://www.monstat.org/eng/page.php?id=234&pageid=48). We have conducted analyses on breast cancer mortality rates using World Standard Population age-standardized and age-specific rates.

Statistical Analysis

The Joinpoint regression model was used to analyze long-term trends in breast cancer mortality and detect the time points when there was a significant change in the linear time trend. In the Joinpoint regression model, the dependent variable x is the year, and the independent variable y is the logarithmically transformed mortality rate. The models also estimated annual percentage change and average annual percentage change of breast cancer rates. Statistical analysis was carried out with the Joinpoint software (Version 4.9.0.0 - March 25th, 2021, available from the Surveillance Research Program of the US National Cancer Institute https://surveillance.cancer.gov/joinpoint/). The selected method for analysis was Grid-search method. The minimum number of observations for the number of points from the end of the time series to the first joinpoint was set to 3. The minimum number of observations between two joinpoints was set to 4. The number of joinpoints was set between 0 and 4. The permutation test was used to choose the best fit joinpoint model, with the total significance level of 0.05. All p-values less than 0.05 were considered significant. We evaluated the models stratified by age groups (aged 35-44, 45-54, 55-64, 65-74 and 75-84). Ages under 35 years and over 85 years were not analyzed, due to small number and 0 value for several years.

Results

Breast cancer mortality data in women for almost 30-year period were analyzed and trends for overall level and for each age groups were examined.

Overall Level

In 2018, breast cancer accounted for 4.64% of all deaths in women and for 19.78% of all cancer deaths in women. In terms of total cancer mortality, it ranked first among women. The total number of deaths from breast cancer increased from 45 in 1990 to 106 in 2018, which equals to an increase of 135%. Age-standardized mortality rates ranged from 11.41/100,000 in 1990 to 20.46/100,000 in 2016 (Table I).

Joinpoint regression model showed no joinpoint for the entire population of all women and age groups. In the observed period, breast cancer mortality rates significantly increased in the women in Montenegro [average annual percentage change (AAPC) = 1.4%; 95% confidence interval (CI): 0.9-2.0] (Table I, Figure 1).

Age Groups

The age group 35-44 showed the lowest mean of age standardized rates, while the highest was recorded in age group 75-84 years. The most affected age group, observed separately by years and also for the entire examined period, was the age group of 55-64 years (Figure 2).

2 of 5 age groups showed decreases in rates over time, statistically significant in age group 35-44 years [AAPC=-3.3%; 95% CI: -6.4-(-0.1)], and not significant in age group 45-54 years (AAPC = -0.7%; 95% CI: -1.6-0.3). The increasing trend was recorded in all older groups with average increases per year of about 3.6% (Table I, Figure 3).

Discussion

According to our knowledge, this is the only study of examining the breast cancer mortality trend in Montenegro. In this study, the breast cancer mortality data in women in Montenegro for over a 28-year period was analyzed. It was found that mortality rates had increased with statistical significance since 1990, showing similarities with a recent study[3,24] for a similar period globally. The

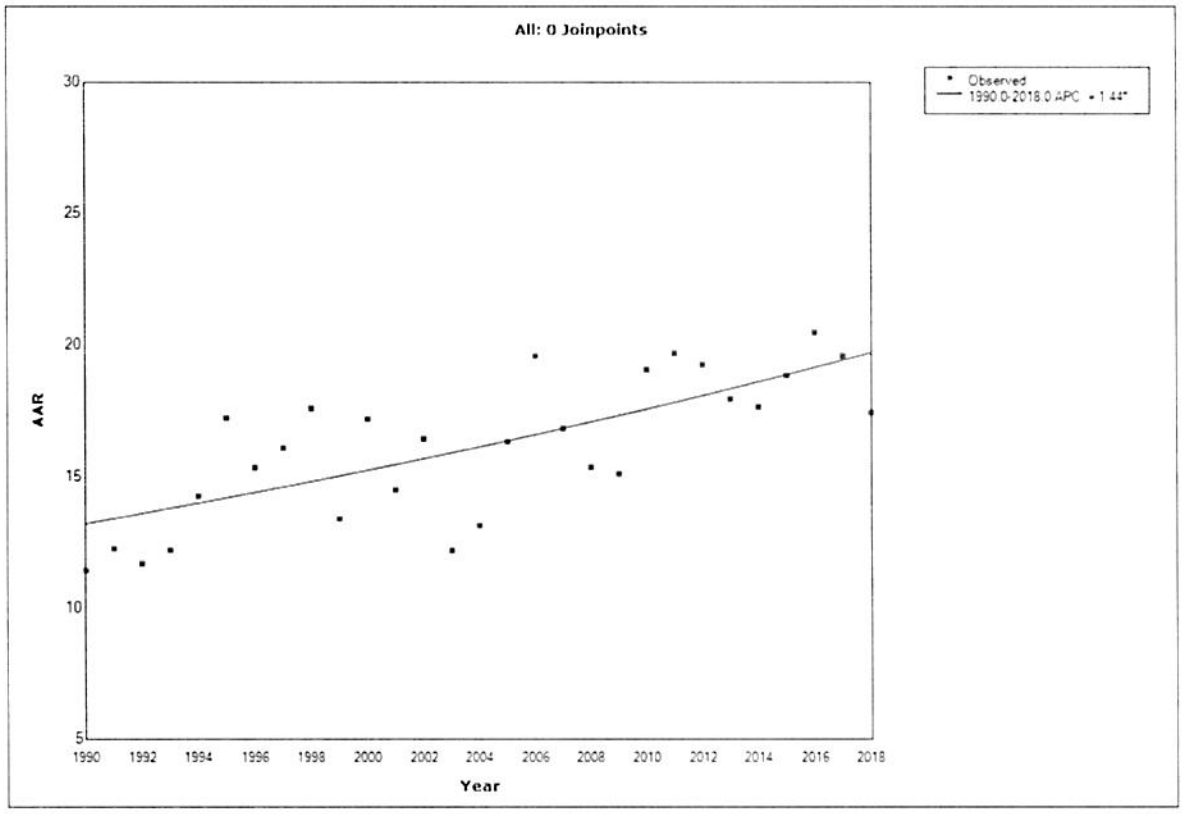

Figure 1. Joinpoint regression analysis of overall women breast cancer mortality in Montenegro from 1990 to 2018. AAR-age adjusted rate standardized to World Standard Population. APC-Annual Percentage Change, *APC was significantly different from zero $p < 0.001$.

average annual increase was 1.4%, with a higher increase in older women. That was significantly higher than the global growth of 0.23% per year in the same period (1990-2017)[3].

Age-standardized rates for the observed period ranged from 11.41/100,000 to 20.46/100,000, similar to those in many low middle-income countries, which are also considered to have the highest mortality rates in the world[25-28]. In the last 30 years, the number of deaths from breast cancer in women has globally increased. In 2019, China, India and the USA were the countries with the highest number of deaths in the world (93.50 × 103, 82.10 × 103, 54.40 × 103; respectively)[4,6]. With a rate of 17.3 per 100,000 population registered in the last observed year, Montenegro had a rate above the global average for the same year, which was 16.3 per 100,000. The highest mortality rates in the same year were recorded in Melanesia (ASR = 25.5), Polynesia (ASR = 21.6), Northern Africa (ASR = 18.4), Caribbean (ASR = 18.1), and Western Africa (ASR = 17.8). The lowest estimated death rates were found in Eastern Asia (ASR = 8.6), Central America (ASR = 10.1), Australia and New Zealand (ASR = 12.6), North America (ASR = 12.6), and South America (ASR = 13.4)[5]. Compared to European countries, Montenegro also had a higher rate[7], followed by Serbia, which, despite high rates, has reported a declining trend in breast cancer mortality in recent years[29]. In Europe, in 2017, the highest mortality rates were observed in Serbia (20.6/100,000 women), followed by other Eastern European countries and Ireland (16.6/100,000). The lowest rate was reported in Spain (10.9/100,000 women), followed by Norway (11.2), Sweden (11.3), Belarus (11.4) and the Czech Republic (12.1)[7]. The average annual percentage change of the breast cancer mortality trend in women was much higher in the Philippines (4.36% for the period 1992-2011) and Thailand (4.35% for the period 1979-2016) than in Montenegro, and lower in Colombia (0.75% for the period 1984 to 2015) and Brazil (0.44% for the period 1979-2015). There was a significant decrease in the following countries: Denmark (-3.38%, 1994-2015), Norway (-2.61, 1986-2015), Estonia (-2.58%, 1981-2015), Canada (-2.46%, 1979-2013) and the United Kingdom (-2.32%, 1979-2015)[5]. In the countries of the European region, a more favorable situation than in Montenegro is recorded in Croatia (+0.3%, 2003-2016) and in Slovenia (-1.9%, 1993-2015)[30]. Breast cancer death rates have declined over time in most high-income countries, while it has remained high and increasing in many middle income and low income counties[25].

There is a limited knowledge about the main drivers of mortality rates changes in different geographical areas and different time periods globally[31]. Recent patterns of mortality for Europe point to a decline in the last three decades. These reductions are higher in Northern than in Eastern Europe[7,8]. Such favorable trends are the result of introducing breast cancer screening and improvements in diagnosis and treatments[32-35]. The exceptions are Poland and Romania. A possible reason for the unfavorable trend in these countries is the ineffective early breast detection program, as well as the long average time from the diagnosis to the start of the treatment, which is about 9.5 weeks for Poland[7,36], up to 38 weeks in extreme cases[7,37]. In Romania, this period is on average 20.5 weeks[7,36], while in the United Kingdom the average waiting time for treatment does not exceed a week[7]. There are no precise data on waiting time from diagnosis to treatment in Montenegro. Due to the pandemic, about 2,000 women in Montenegro, whose screening revealed a change in breast tissue, have been waiting for clarification since January 2020.

There are several factors that could influence the mortality trend, and none of them has been singled out as particularly dominant[7]. Researches indicate the importance of adequate screening, diagnosis, and treatment as the most important factors influencing cancer mortality rates in general[7,10,11]. It is encouraging to conclude that in countries (North America and Central Europe) that have introduced adequate screening, mortality rates have had declining trend[38,39]. In contrast, increasing mortality in low-income and low-middle-income countries may be due to a lack of screening programs, and thus too late-stage diagnoses, as well as obstacles to cancer treatment[40]. It is assumed that about two-thirds of the decline in breast cancer deaths in Western Europe and North America is due to the introduction of new treatments, and one-third is due to early detection and better diagnosis[7].

There is no research in Montenegro that could contribute to explain the high percentage of deaths from breast cancer. In general, a large percentage can be attributed to relatively poor surveillance of cancer diseases in the country. Efforts for improving cancer control have been made in recent years[15,17-19] and we can expect possible effects in a few years. Montenegro has introduced a screening program[41] that began on 23 December 2015. It used to cover only a total of 30-40% (an excep-

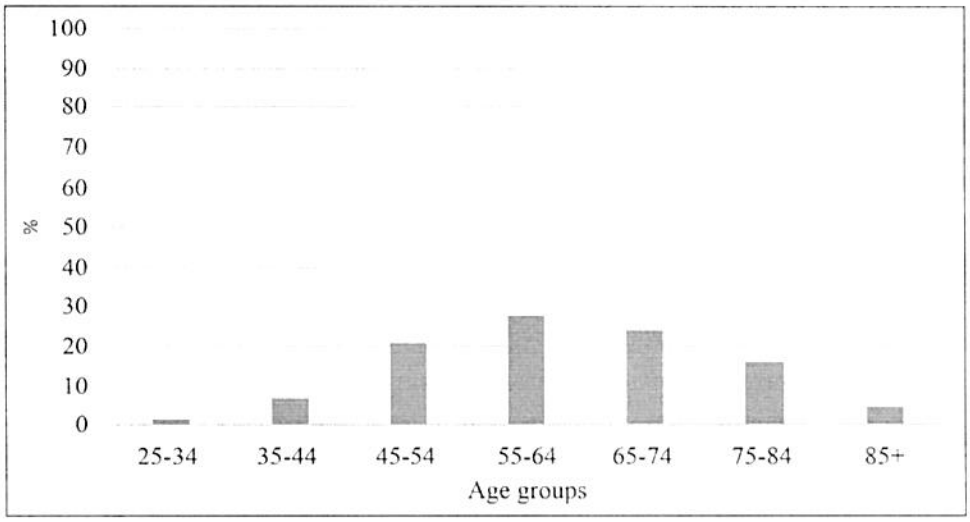

Figure 2. Distribution of breast cancer mortality by age groups in women in Montenegro, 1990-2018.

tion was made in 2020 in which the percentage was only 17.49%, due to the COVID-19 pandemic) of the target population. Early detection rate of breast cancer was 11 per 1,000 screened women, according to the screening department of the Institute of Public Health. The effect of screening program can be expected within 3-5 years from its beginning[42,43]. Unfortunately, we have not received promising results up to now. One of the goals of the National Breast Cancer Program in Montenegro[18] was to reduce breast cancer mortality by 15% in 5 years from its implementation. It has not been achieved so far. In order to have effective Early Breast Detection Program, a country must have adequate facilities to manage all new cases detected with the screening, as well as the resources to ensure their follow-up[41]. The postponement of screening in 2020 in Montene-

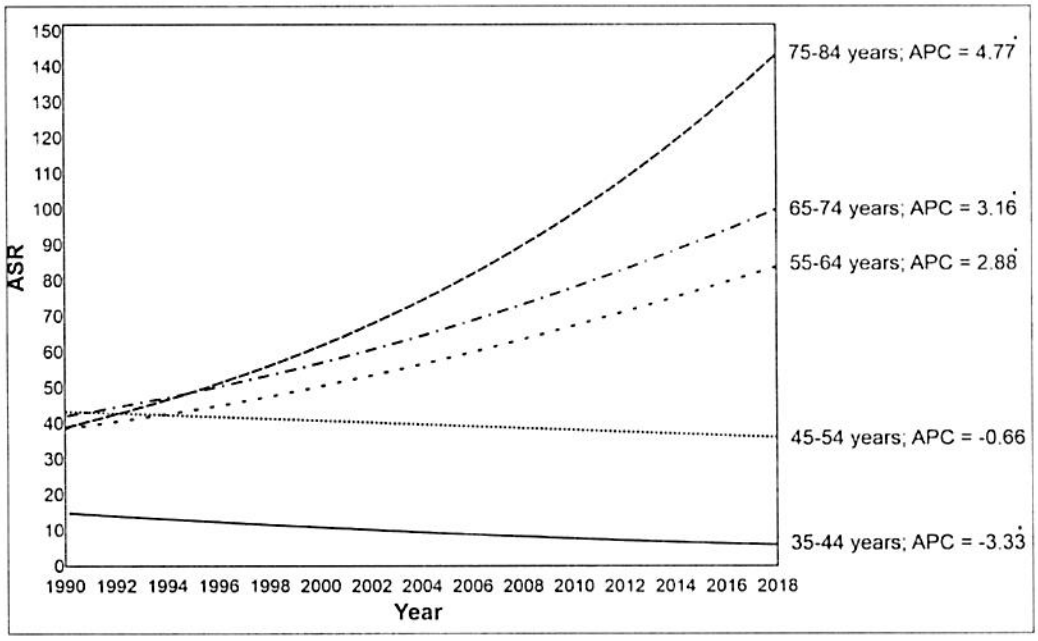

Figure 3. Joinpoint regression analysis of women breast cancer mortality by age groups in Montenegro from 1990 to 2018. ASR-Age Specific Rate. APC-Annual Percentage Change. *APC was significantly different from zero $p < 0.001$.

Table I. Mortality Rate per 100,000 population for women breast cancer in Montenegro and Average Annual Percentage Change of Rates for period 1990-2018.

	AAR†	ASR‡				
Year	All women	35-44 age group	45-54 age group	55-64 age group	65-74 age group	75-84 age group
1990	11.41	14.09	33.77	22.39	57.37	72.09
1991	12.24	14.28	38.98	38.39	34.16	40.25
1992	11.68	6.94	42.39	40.34	50.04	20.02
1993	12.19	11.33	48.47	39.82	37.07	30.41
1994	14.25	29.16	36.15	45.08	39.39	20.27
1995	17.24	22.31	38.57	47.28	71.70	50.24
1996	15.34	6.61	52.46	58.73	41.01	78.83
1997	16.09	17.46	48.23	52.96	56.08	87.39
1998	17.60	17.36	49.24	62.55	54.45	37.97
1999	13.39	4.33	39.38	48.50	60.64	72.97
2000	17.19	18.66	56.57	45.58	73.43	72.02
2001	14.48	13.93	37.55	61.59	51.18	79.66
2002	16.44	18.51	32.78	64.77	80.13	94.91
2003	12.16	13.83	32.62	28.97	61.70	79.10
2004	13.12	6.93	30.11	60.56	42.92	100.64
2005	16.32	2.34	55.36	44.07	77.03	82.26
2006	19.58	21.25	43.57	73.93	69.26	80.33
2007	16.84	21.35	34.10	71.96	48.42	114.18
2008	15.35	2.38	40.75	69.49	48.80	90.16
2009	15.09	11.98	40.82	55.33	70.93	53.69
2010	19.07	4.79	38.87	82.14	87.67	148.93
2011	19.68	2.39	53.03	76.79	93.42	124.89
2012	19.26	14.26	30.11	77.38	71.29	78.85
2013	17.96	4.72	42.06	66.07	101.02	94.38
2014	17.66	4.69	23.57	72.57	118.19	119.58
2015	18.84	11.62	35.68	86.67	82.94	127.39
2016	20.46	6.92	33.68	83.75	112.74	136.79
2017	19.58	9.18	31.49	73.69	119.98	125.54
2018	17.43	0.00	46.20	61.58	78.80	116.71
AAPC§ (95%CI* of AAPC§)	1.4 (0.9-2.0)	-3.3 [-6.4-(-0.1)]	-0.7 (-1.6-0.3)	2.9 (1.9-3.9)	3.2 (2.1-4.3)	4.8 (3.1-6.5)
p	< 0.001	< 0.001	0.200	< 0.001	< 0.001	< 0.001

†Age adjusted rate, ‡Age specific rate, §Average Annual Percentage Change, *Confidence interval.

gro, due to the COVID-19 recommendations[44], has extended the waiting period for clarification of changes observed by screening, and thus for treatment. It could further increase mortality from breast cancer in the future in Montenegro, which is difficult to assess now[7,45].

In addition to all the above, we cannot exclude the risk factors for the development of breast cancer that have been identified so far. These factors are: alcohol consumption, obesity, younger age for menarche, older age for menopause, fewer births, less breastfeeding, lack of physical activi-

ty and unhealthy lifestyles, such as fat consumption and low intake of fruits, vegetables and grains and others[46]. Alcohol use, obesity, diabetes, and lack of physical activity jointly contribute to tumor mortality of about 30%. According to estimates, Montenegro is among the countries with the highest mortality rate attributable to tobacco use, along with Serbia and Lebanon[6]. Approximately one third of breast cancers can be avoided by appropriate lifestyle modifications and mentioned risk factors[47]. Considering the latest research on the prevalence of risk factors in Montenegro, the situation is not very promising: 35.4% of adults in Montenegro are active smokers, while the average alcohol consumption per year is 10.3 liters per person older than 15 years[48]. Obesity and physical inactivity are also present in the Montenegrin population: 40% of the adult population in Montenegro is overweight, 15% is obese, only 13% exercises more than three times a week, of which only 8.6% daily[16]. However, it is difficult to estimate the contribution of these already known risk factors to breast cancer mortality in Montenegro.

Conclusions

There is a growing trend of breast cancer mortality in Montenegro. The age group 55-65 is the most affected. It is necessary to create specific programs (to ensure that women do not wait for expert examinations of suspected mammograms and to shorten the waiting time from the moment of diagnosis to appropriate treatment) for urgent action, in order to reduce this undesirable trend. At the same time, support is needed from the competent institutions to increase the coverage of screening and to prevent breast cancer in the target population.

Conflicts of Interest

The authors declare no conflicts of interest.

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Time trends in liver cancer mortality rates in Montenegro from 1990 to 2018

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Objective Liver cancer is the third most common cause of cancer-related deaths worldwide. Hepatitis B and C infections are the main factors affecting mortality. During recent years, Montenegro conducted activities on eradication of viral hepatitis according to the global strategy for the primary prevention of liver cancer mortality. The objective of this study was to assess the liver cancer mortality trend in Montenegro for the period of 1990–2018 using regression techniques.
Methods liver cancer mortality data in Montenegro from 1990 to 2018 were collected. Mortality rates were age standardized to the World Standard Population. The joinpoint, linear and Poisson regressions were used to assess liver cancer mortality trends both overall and gender specific.
Results The mortality trend was constant, with no significant increase or decrease in mortality rates both at the overall level and by gender. The number of cases, however, increases significantly at the overall level by an average of 1.4% per year [average annual percentage change (AAPC) (95% confidence interval, CI): 1.4 (0.5–2.3); $P = 0.004$] and in women by 1.9% per year [AAPC (95% CI): 1.9 (0.8–3.1); $P = 0.002$]. In men, there was no change in the number of cases. The three age groups most burdened by mortality from liver cancer were 65–74 (34.9%), 75–84 (26.6%) and 55–64 (25.8%).
Conclusion The consistent implementation of prevention measures and hepatitis virus infection treatment has played a role in partially favorable liver cancer mortality trends in Montenegro. It is crucial to closely monitor guidelines for this cancer and give particular attention to the elderly population as the most affected. Eur J Gastroenterol Hepatol 36: 622–627

Introduction

Liver cancer remains one of the most common malignancies in many countries worldwide [1]. Global Cancer Observatory estimates that liver cancer claimed the lives of over 830 000 people in 2020. This makes liver cancer the third most common cause of cancer-related deaths worldwide, the second most common cause for men and the sixth most common cause for women. Male mortality is two to three times higher than female mortality in many parts of the world including Mongolia, Thailand, Cambodia, Egypt and Guatemala [2]. Since liver cancer is usually diagnosed at an advanced stage, it has one of the worst prognoses of all cancers, regardless of advanced diagnostic and therapeutic techniques [1].

Hepatocellular carcinoma accounts for 75–85% of all deaths recorded worldwide from primary liver cancers, while intrahepatic cholangiocarcinoma accounts for 10–15% of deaths [2]. It is estimated that chronic hepatitis B (HBV) (53%) or hepatitis C (HCV) (25%) viral infection is responsible for approximately three-quarters (78%) of liver cancer cases worldwide [3]. Other risk factors for liver cancer include consumption of foods contaminated with aflatoxin, excessive alcohol consumption, obesity, diabetes and smoking [2–5]. Results from meta-analyses, however, suggest that consuming more coffee may reduce the risk of liver cancer [6]. In addition, viral infections are the largest contributor to mortality worldwide; HBV and HCV infections account for 56 and 20% of liver cancer deaths, respectively [2,7]. Excessive alcohol consumption is second, accounting for 25% of liver cancer deaths worldwide [8]. Some studies show that the consumption of animal fat is significantly positively correlated with mortality from liver cancer. Nevertheless, consumption of vegetables, poultry, fish, eggs and yogurt has been shown to have a protective effect on liver cancer mortality [9].

An important global strategy for the primary prevention of liver cancer is the eradication of viral hepatitis [2,7]. In Montenegro, as in most other countries, the national infant immunization program includes three vaccinations as the main means of targeted prevention of HBV infection [2,10]. Montenegro has been implementing the HBV vaccination program since 2002 [11]. There is currently no vaccine to protect against HCV [2]. The use of sterile needles, prevention of mother-to-child transmission, transfusion screening and infection control in health care facilities are just a few examples of safety measures that can help improve infection control and combat HCV [2,12]. Montenegro continuously complies with guidelines for the

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treatment of HBV and HCV infections [13,14]. In 2019, Montenegro adopted the National Good Clinical Practice Guidelines for the treatment of chronic hepatitis C, following the recommendations of the European Society for the Treatment of Liver Diseases (EASL). Achievement of a stable virologic response is defined as the presence of undetectable HCV RNA 12 weeks after completion of treatment [14]. The WHO published a global strategy on viral hepatitis in 2016, covering the years 2016–2021 [15,16]. The strategy included ambitious goals such as a 90% reduction in new cases, 80% treatment of eligible individuals and a 65% reduction in mortality rates by 2030. In line with the goals of the WHO strategy, targeted screening is recommended for high-risk HCV populations. It assumes anti-HCV antibody testing for individuals with a history of exposure/risk behavior (individuals who have had medical or dental procedures in health care facilities where inadequate infection control practices were implemented). Prisoners and former prisoners, persons who have received blood products that have not previously been serologically tested, HIV-positive persons, children of HIV-positive mothers, intravenous drug users, persons with tattoos, piercings and similar nonsterile procedures should be tested to prevent disease progression and transmission of the HCV virus [17].

A practical, cost-effective, time-efficient method of implementing the strategy on viral hepatitis could be a microelimination. If it proves effective for some groups, it could catalyze more ambitious initiatives [15,16]. Target groups for microelimination include individuals undergoing intravenous therapy, persons on opioid substitution treatment, hemophiliacs, hemodialysis patients, transplant patients, prisoners, people with high-risk sexual behavior, and migrants from high-prevalence areas [18]. In 2016, Montenegro initiated the microelimination of high-risk populations.

There is no information available on the impact of HBV and HCV infection control initiatives on the mortality from liver cancer in Montenegro.

The objective of this study was to assess the mortality liver cancer trend in Montenegro for the period of 1990–2018 using regression techniques.

Methods

Data on liver cancer mortality in Montenegro from 1990 to 2018 were collected. Liver cancer was identified using the International Classification of Diseases 9th edition code 155 and 10th edition code C22 [19]. Death certificates completed by physicians who identify the time and cause of death were the major source of data. Data sources up to 2009 were from the State Statistics Office (unpublished data up to 1999 and for the period 1999–2009 published in the Statistical Yearbooks of the Institute of Public Health of Montenegro) [20]. For the period after 2009, the source of data on the causes of death was the Institute of Public Health [20]. The population data comes from the Statistical Office of Montenegro [21]. Mortality rates were age standardized to the World Standard Population [22] to estimate both general and gender-specific trends.

The Joinpoint regression model examined long-term shifts in liver cancer mortality and identified significant changes in the linear time trend. In this model, the dependent variable x represents the year while the independent variable y symbolizes the logarithmically transformed mortality rate. These models also provided insights into the estimated annual percentage change (EAPC) and average annual percentage change (AAPC) in liver cancer mortality rates. Analyses were performed using Joinpoint software, version 5.0. 2 May 2023, from the Surveillance Research Program of the US National Cancer Institute [23]. The natural logarithm of the age-standardized rate (ASR) was fitted to a regression line, $\ln(\text{ASR}) = \alpha + \beta x + \varepsilon$, where x denotes the calendar year. The EAPC was calculated as $100 \times (\exp(\beta) - 1)$ and its 95% confidence interval (CI) was also derived from the linear regression model [23]. To determine the EAPC, the regression line was fitted to the natural logarithm of the rates using the calendar year as the independent variable. The grid search method was chosen for the analysis. The minimum number of observations for points from the end of the row to the first connection point was set to three and between two connection points to four. The number of connection points was set between zero and four. The permutation test facilitated the selection of the best-fitting junction model with an overall significance level of 0.05. Gender differences were assessed using the parallelism test. In addition to joinpoint regression, both linear and Poisson regressions were applied. They were both carried out in the Statistical Software for Social Sciences SPSS 26 (IBM Corp., Armonk, New York, USA). Ethical approval and consent were not required as this study was based on publicly available data.

Results

From 1990 to 2018, liver cancer claimed the lives of 1096 people in Montenegro (58.49% men and 41.51% women) (Table 1), ranking it as the seventh most common cancer related to death during the observed period. The overall average number of deaths per year was 37.8 (22.1 men, 15.7 women) and the average age-standardized rate was 3.8 (5.1 men, 2.8 women). In men, age-standardized mortality rates were 1.41 times higher (Table 1). Joinpoint regression did not reveal any changes in the trend. The mortality trend was constant, with no significant increase or decrease in mortality rates both at the overall level and by gender (Table 1, Fig. 1). By joinpoint regression increase in mortality rate was registered only for the 75–84 age group by an average of 1.8% per year [AAPC (95% CI): 1.8 (0.3–3.3); $P = 0.020$] (Table 1). Using linear regression, we found an increase in the mortality rate in the 85+ group, but also a decrease in the death rate in the 55–64- year-old group for men and at the overall level as well as in the 35–44-year-old group for women and at the overall level (Table 1).

The number of cases, however, has increased significantly at the overall level by an average of 1.4% per year [AAPC (95% CI): 1.4 (0.5–2.3); $P = 0.004$], and in women by 1.9% per year [AAPC (95% CI): 1.9 (0.8–3.1); $P = 0.002$]. In men, there was no change in the number of cases at the overall level, but an increase in the number of cases in the age group 75–84 was registered, by an average of 4.4% per year. There was a similar increase for this age group in women (4%). This resulted in an average increase of 4.6% in the 75–84

Table 1. Descriptive statistics for liver cancer deaths cases and mortality rate in Montenegro and results of regression analyses for a period of 1990–2018

	Joinpoint regression for death cases	Joinpoint regression for mortality rate	Linear regression for mortality rate	Poisson regression for death cases	Mortality rate	Death cases	
C22	AAPC (95% CI)		β (95% CI)	β (95% CI)	Mean ± SD		Overall death cases
Male	0.9 (−0.3 to 2.0)	−1.1 (−2.3 to 0.1)	−0.05 (−0.117 to 0.010)	0.009 (0.0001 to 0.018)	22.10 ± 5.66	5.12 ± 1.46	641
15–24							1
25–34							1
35–44							13
45–54			−0.120* (−0.237 to 0.01)	0.006 (−0.029 to 0.042)	2.00 ± 0.98	4.57 ± 2.62	52
55–64	−0.6 (−2.7 to 1.5)	−1.9 (−3.9 to 0.3)	−0.460* (−0.897 to −0.020)	−0.010 (−0.030 to 0.005)	5.90 ± 3.00	18.97 ± 10.16	171
65–74	−0.1 (−2.1 to 2.0)	−1.5 (−3.4 to 0.4)	−0.470 (−1.229 to 0.282)	0.002 (−0.013 to 0.018)	7.72 ± 3.32	37.85 ± 16.79	224
75–84	4.4* (2.6 to 6.3)		0.939 (−0.093 to 1.972)	0.047* (0.028 to 0.066)	5.45 ± 2.98	58.55 ± 23.66	158
85+			2.888* (0.729 to 5.048)	0.121* (0.058 to 0.184)	0.78 ± 1.09	37.75 ± 52.66	21
Female	1.9* (0.8 to 3.1)	0 (−1.1 to 1.1)	0.004 (−0.026 to 0.035)	0.020* (0.009 to 0.031)	15.69 ± 4.61	2.82 ± 0.66	455
15–24							0
25–34							1
35–44							6
45–54			−0.020 (−0.169 to 0.117)	0.020 (−0.027 to 0.069)	1.08 ± 1.29	2.38 ± 3.10	28
55–64	0.1 (2.0 to 0.1)	−1 (−2.8 to 0.8)	−0.120 (−0.353 to 0.095)	0.000 (−0.021 to 0.022)	3.86 ± 1.77	11.04 ± 4.97	112
65–74	1.1(−1.5 to 3.7)	0.1 (−2.3 to 2.5)	0.048 (−0.424 to 0.521)	0.011 (−0.007 to 0.029)	5.45 ± 2.92	20.56 ± 10.20	158
75–84	4* (1.9 to 6.1)		0.861* (0.142 to 1.581)	0.051* (0.030 to 0.072)	4.59 ± 2.69	32.42 ± 17.17	133
85+			1.329* (0.168 to 2.490)	0.089* (0.024 to 0.154)	0.61 ± 0.79	19.08 ± 27.47	17
All	1.4* (0.5 to 2.3)	−0.6 (−1.5 to 0.3)	−0.020 (−0.056 to 0.014)	0.013* (0.007 to 0.020)	37.79 ± 8.33	3.85 ± 0.78	1096
15–24							1
25–34							2
35–44	−4.8* (−7.3 to −2.4)		−0.050* (−0.092 to −0.001)	−0.070* (−0.137 to −0.010)	0.66 ± 0.90	0.74 ± 0.99	19
45–54	−0.1 (−2.9 to 2.9)		−0.070 (−0.168 to 0.020)	−0.010 (−0.037 to 0.014)	2.76 ± 1.79	3.46 ± 2.13	80
55–64	−0.3 (−1.9 to 1.3)	−1.5 (−3.0 to 0.1)	−0.280* (−0.528 to −0.040)	−0.000 (−0.021 to 0.007)	9.76 ± 3.73	14.77 ± 5.79	283
65–74	0.3 (−1.6 to 2.2)	−0.9 (−2.6 to 0.8)	−0.160 (−0.634 to 0.312)	0.005 (−0.006 to 0.017)	13.17 ± 5.20	28.12 ± 10.30	382
75–84	4.6* (3.0 to 6.1)	1.8* (0.3 to 3.3)	0.939* (0.304 to 1.575)	0.049* (0.034 to 0.063)	10.03 ± 5.01	42.77 ± 15.87	291
85+	6.7* (4.0 to 9.4)		1.920* (0.895 to 2.945)	0.096* (0.051 to 0.141)	1.31 ± 1.44	25.98 ± 27.49	38

β, regression coefficient; AAPC, average annual percentage change; CI, confidence interval; F, female; M, male.
*AAPC and β are statistically significantly different from zero at a *P* value less than 0.05.

group as a whole. An increase in the number of cases was also registered in the age group 85+ [AAPC (95% CI): 6.7% (4.0–9.4); $P < 0.001$]. Also, there was a registered decline in the number of cases aged 35–44 of −4.8% on average per year [AAPC (95% CI): −4.8% (−7.3 to −2.4); $P < 0.001$]. Poisson regression registered similar results (Table 1).

According to the results of the parallelism test, the mortality trend in women and men was parallel [finally selected model: AAPC difference (95% CI): −1.1 (−2.7 to 0.4); $P = 0.157$].

The three age groups most burdened by mortality from liver cancer were 65–74 (34.9%), 75–84 (26.6%) and 55–64 (25.8%) (Fig. 2).

Discussion

This is the first analysis of the mortality trend in Montenegro related to liver cancer. Over the 30 observation years, there was a statistically significant increase in the number of deaths per year of 1% and a statistically insignificant decrease in age-standardized mortality rates of −0.6%. In terms of total deaths from cancers in Montenegro over the last 30 years, liver cancer ranks seventh (at the global level, third) [2]. The average rate for the observed period was 3.8 deaths/100 000, which is significantly lower than the global level (16.1/100 000). Across different nations, the mortality trends from liver cancer vary significantly [2,24,25]. Global age-standardized death rates from liver cancer have decreased by 33.4% compared to 1990. Some countries experienced up to a two-fold increase in rates in 2019, such as countries from Central Asia, Australasia and high-income countries in 2019 [26]. Globally, mortality rates showed a significant monotonic, slightly decreasing trend with an AAPC of −1.40. East and Southeast Asia had the highest liver cancer burden among geographic regions from 1990 to 2019 [24], accounting for approximately 85% of global deaths responsible from 1990 to 2017 [25]. The lowest mortality rates are in Southern, Central and Western Asia as well as Central and Eastern Europe [2,27]. In Montenegro, rates for men were 1.41 times higher (5.1 for men, 2.8 for women). And at the global level, age-standardized mortality rates were higher in men than women worldwide [24,28].

Scientific evidence indicates that men experience higher rates because they are more likely to engage in well-known risk factors such as alcohol consumption and smoking [29,30], even though the exact cause of the gender differences is still unknown [24]. In Montenegro, rates are consistent for both men and women, but the proportion of female cases was sharply rising. Research conducted on a global scale between 1990 and 2019 revealed that mortality rates for men have decreased by nearly 32.3%, while mortality rates for women have decreased by 35.1% over the same 30-year period [24]. Age-standardized death rates have varied across different regions for both men and women, but overall, rates have declined for both genders during this time [24].

While rates in Montenegro remain stable with no discernible pauses in the trend for either gender, variations are noted worldwide with varying percentage changes for men and women. Men's rates increased by an average of 2% between 1990 and 1996. Thereafter, there was distinct AAPC declines of −1% between 1996 and 2000, −9% between

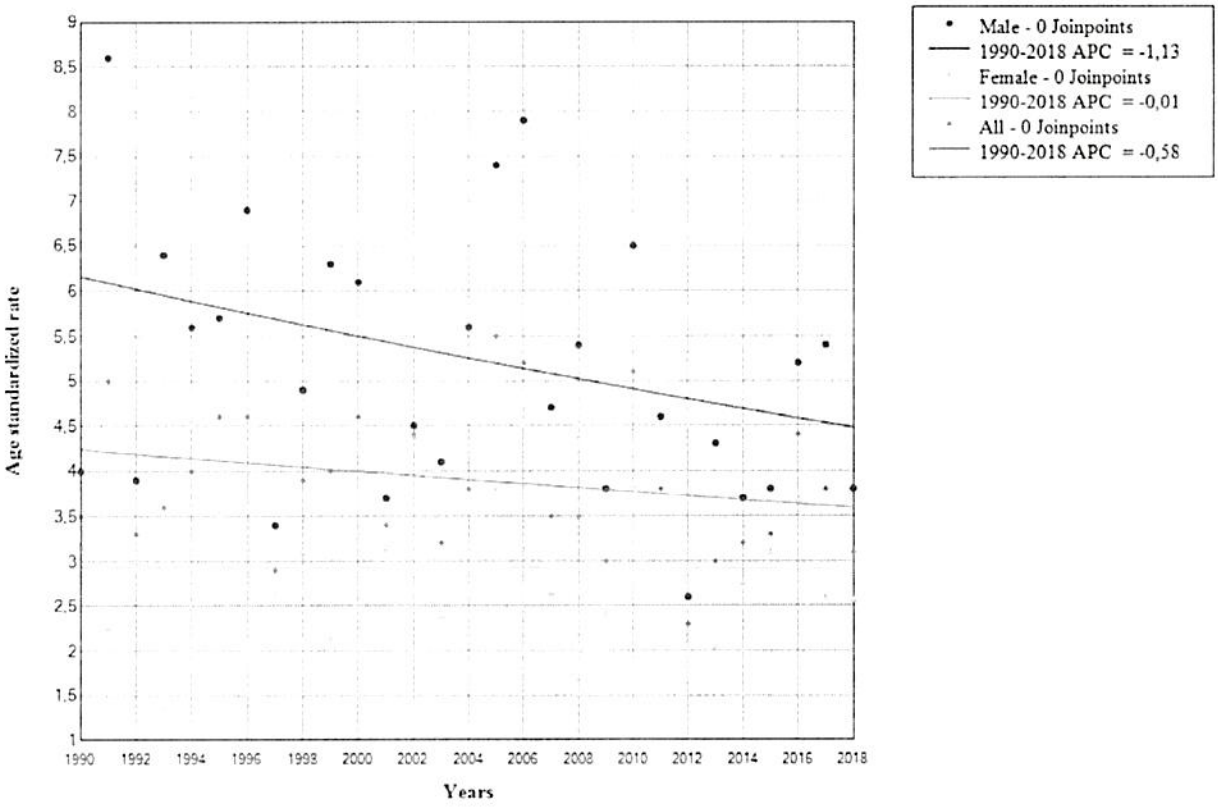

Fig. 1. Joinpoint regression analysis of liver cancer mortality in Montenegro from 1990 to 2018. APC, annual percentage change.

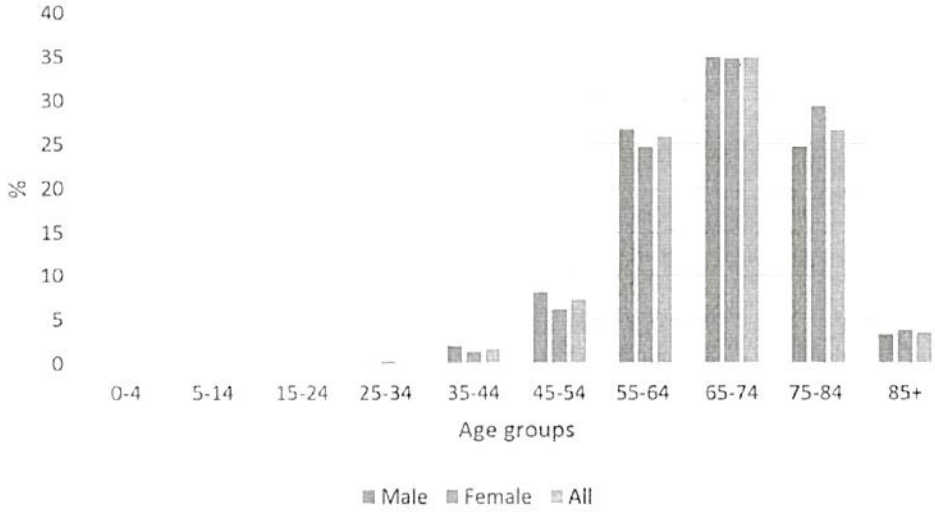

Fig. 2. Distribution of liver cancer mortality by age groups in Montenegro, 1990–2018.

2000 and 2004, −1% between 2004 and 2011 and a slight increase (0.2%) between 2011 and 2019. For women, the initial trend was an increase of 0.9% per year from 1990 to 1996. After that, there was a decline with varying percentage changes from 1996 to 2000, 2000 to 2004 (−7%), 2004 to 2012 (−1%) and 2012 to 2019 (−0.3%) [24].

In Montenegro, mortality rates are higher in older age groups. In general, mortality rates vary by age group worldwide. There were more people in the age ranges of 50–69 and ≥70 years than in the 15–49 and 0–14 age groups [24,30]. The 75–84 age group in Montenegro was showing an overall growth trend, with rates rising at an average annual rate of 1.8%. By using linear regression, we were able to determine that the death rate in the 85+ group was rising, while the death rates among men in the 55–64 group and overall as well as among women in

the 35–44 group were falling. Over time, mortality has decreased globally across all age groups. Between 1990 and 2019, AAPC mortality was significantly negative for all age groups: 0–14 (−1.8), 15–49 (−2.1), 50–69 (−1.8) and 70+ (−0.4). Until mid-1999, mortality in the 50–69 and 70+ age groups tended to increase, then it fell sharply between 2000 and 2005, but it did not change again between 2006 and 2019 [24]. The neighboring country of Serbia [9,28] also shows favorable trends in mortality; over a comparable period from 1991 to 2015, there was a significant decrease of 1% per year for the overall level, 1% for men and 1% for women, with an average rate that was more than 30% higher than in Montenegro.

While in Montenegro there was a statistically significant mortality decrease in the younger age groups (45–54, 55–64 for men and 35–44 for women), in Serbia there was a significant mortality increase in the older age groups (85+ for men, 75–84 and 85+ for women). In men, the mortality trends from liver cancer were declining in the age groups <80 years, although in those aged 50–54 and 75–79, the decline was not statistically significant. Women's liver cancer mortality decreased significantly in the 55–79 age group, but nonsignificant declines were noted in the 45–49 and 50–54 age groups, as well as in the 80–84 age group [28]. Aside from the implementation of the HBV vaccination program and the screening of blood products for HCV and HBV markers [31], other factors contributing to Serbia's favorable mortality trend include increased prevention efforts and changes in the prevalence of risk factors [9,28]. Socioeconomic factors contribute significantly to reducing mortality rates around the world, especially concerning access to health care [32–34]. Additional factors contributing to the overall decline in mortality include improved therapeutic approaches, the creation of new, multimodal treatment options, improved cancer control in recent years as a result of public health interventions, preventive measures, which frequently involve self-initiated examinations, improved population health education [24] and increased access to health care services.

The death rate is higher in nations with a lower Human Development Index and in nations where risk factors are more common [24]. For instance, the nations of East and Southeast Asia, which have long employed primary and secondary preventive measures, new treatments and improved antiviral therapy, are seeing the steepest declines [2,29,35,36]. Since the HBV vaccination was implemented in these nations in the early 1980s, there has been a noticeable decline in both the incidence of hepatocellular carcinoma and the prevalence of HBV infection. Because of enhanced antiviral therapy, HCV seroprevalence is also declining. Furthermore, there is evidence that less aflatoxin exposure lowers mortality [2,36,37]. Since the late 1970s, the death rate from liver cancer has declined in many high-risk East and Southeast Asian countries, such as China, Taiwan, Korea, Philippines and Japan since the 1990s [2,29,35].

As viral hepatitis is the primary cause of liver cancer deaths globally, scientists emphasize the importance of its eradication. It was estimated that HBV infection causes 56% of liver cancer deaths globally, whereas HCV infection causes 20% of these deaths [2,7]. As of the end of 2019, 189 nations had included the HBV vaccine in their national infant immunization campaigns, and 85% of people worldwide had received three doses of the hepatitis B vaccine [2,10, 38]. Montenegro has been carrying out the HBV vaccination program since 2002 [11]. In 2019, the coverage with three doses was 68.08%. Because of the coronavirus disease 2019 pandemic, however, the coverage percentage decreased to 64.63% in 2020 [20].

Obtaining access to viral testing and treatment is a significant challenge in the majority of low-income nations [2,39,40]. For instance, the majority of HCV infections occur in health care facilities as a result of unsafe injection practices and other invasive procedures, and the highest prevalence of HCV is found in low-income countries [2,11].

Regarding the treatment of HBV and HCV infections, Montenegro follows the guidelines [13,14]. The recommendations call for the use of nucleotide/nucleoside analogs in the treatment of HBV infection, as well as the lifelong administration of entecavir and tenofovir (until HBsAg becomes negative). After that, for 48 weeks, interferon (IFN) alfa-2a is injected subcutaneously once a week. Montenegro embraced the National Good Clinical Practice Guidelines in 2019 for the management of chronic hepatitis C by the recommendations of the EASL [14], which include the new generation of direct-acting antiviral agents (DAAs) as the first line of therapy. Treatment using DAAs according to these guidelines has been applied in Montenegro since 2016.

Given their virological efficacy, ease of administration, safety and tolerability for both naive HCV patients and those who have previously received IFN therapy, IFN-free, ribavirin-free and DAA-based regimens are utilized in Montenegro to treat HBV infection in both cirrhosis-free and cirrhosis-affected individuals. For therapy to be effective, the patient must cooperate well. Therapy is tolerable with minimal side effects. Eight to sixteen weeks are allotted for treatment. The law [41] mandates that infectious disease specialists in Montenegro regularly assess risk factors for viral hepatitis in primary health care, take action to prevent the disease's progression and reduce its transmission, and notify patients of their infections. In keeping with this trend, the government, WHO, family physicians, other specialists, politicians, scientists, pharmaceutical companies, patient associations and the community are all necessary for infectious disease/hepatologists in Montenegro to be able to carry out their daily tasks.

In Montenegro, the Infectious Disease Clinic of the Clinical Center of Montenegro is responsible for the microelimination of hemodialysis patients, which began in the period from 2016 to 2019.

Afterward, the ongoing microelimination of former intravenous drug user patients continued. They are undergoing oral suspension treatment in conjunction with the Clinic for Psychiatry of the Clinical Center of Montenegro.

Apart from viral factors, it is important to also consider nonviral factors such as obesity, diabetes and excessive alcohol consumption. These factors have been increasingly prevalent in recent years.

Conclusion

The consistent implementation of prevention measures and hepatitis virus infection treatment has played a role in partially favorable liver cancer mortality trends in Montenegro. It is crucial to closely monitor guidelines for

this cancer and give particular attention to the population aged 65–74, which experiences the highest mortality rates, as well as the population aged 74–84, where both the number of cases and rates of mortality are rising.

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None.

Conflicts of interest

There are no conflicts of interest.

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Trends in Gastric Cancer Mortality in Montenegro, 1990–2018: Joinpoint Regression

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Keywords
Gastric cancer · Mortality · Trends

Abstract
Introduction: Gastric cancer (GC) remains a significant global public health problem, despite the decreasing trends in GC mortality rates in the last 5 decades. Our study aimed to examine the pattern of GC mortality in Montenegro between 1990 and 2018 and to contribute to the future by designing a national long-term strategy for the control and prevention of GC. ***Methods:*** Gastric cancer mortality data in Montenegro from 1990 to 2018 were collected. Mortality rates were age-standardized to the World Standard Population for estimating both the overall and gender-specific trends. The joinpoint regression model was used to assess GC mortality and identified significant changes in the linear time trend. Linear and Poisson regressions were also applied for additional trend analyses. ***Results:*** Joinpoint regression reveals a statistically significant decrease in the age-standardized rate for the overall level, on average by 1.4% per year (AAPC [95% IP] = −1.4 [−2.4 to −0.4]; $p = 0.007$), which was due to a decrease in the age-standardized rate in men with an average annual change of −1.8% (AAPC [95% IP] = −1.8 [−2.9 to −0.6]; $p = 0.003$), while in women the rates were stable ($p = 0.565$). The results for age groups indicate that a decline was registered at the overall level, and among men, as a consequence of the trend of decreasing age-specific rates for the age group 55–64 on average annually by 2% among men (AAPC [95% IP] = −2 [−3.8 to −0.1]; $p = 0.035$), and for the overall level (AAPC [95% IP] = −2 [−3.7 to −0.3]; $p = 0.026$). ***Conclusion:*** Our findings indicate a noteworthy decline in age-standardized overall GC mortality rates among men in Montenegro, while rates for women have remained constant. National strategies to further reduce mortality rates for GC are necessary.

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Introduction

Epidemiology

Gastric cancer used to be the most common cancer in the world and was the leading cause of death in men worldwide until the mid-1990s, when it was overtaken by lung and colorectal cancer [1]. Nevertheless, gastric cancer remains a significant global health problem in many countries [1, 2]. According to the Global Cancer Statistics (Globocan), gastric cancer accounted for an estimated 769,000 deaths in 2020, which is equivalent to 1 in every 13 deaths from cancers worldwide [2].

Gastric cancer is still a significant cause of death in many parts of the world, especially in men in several countries in South and Central Asia, such as Iran, Afghanistan, Turkmenistan, and Kyrgyzstan [2]. According to recent estimates from Europe, high rates of gastric cancer have been observed in Central and Eastern European regions, including Belarus, Ukraine, the Russian Federation, and the Baltic States in Northern Europe, including Latvia [3]. Epidemiological research shows significant geographical variations in gastric cancer around the world, with differences in gender, age, and sociodemographic index between regions and countries. The burden of this type of cancer increases with age in both genders [4]. The rates worldwide are twice as high in men as in women [2]. The total number of deaths globally due to gastric cancer is increasing and is almost 20% higher than the number in 1990 [4].

Etiology of Gastric Cancer

Chronic *Helicobacter pylori* (*H. pylori*) infection is a significant risk factor and increases the likelihood of developing gastric cancer within 10 years of infection by about six times [5]. Established risk factors for gastric malignancy, other than *H. pylori*, include alcohol consumption, smoking, low fruit intake, high consumption of processed meat, and grilled or grilled meat and fish. Evidence suggests that the consumption of salt and salt-preserved foods can also increase the risk of gastric cancer [6–9].

Gastric cancer is highly influenced by behavior and is preventable [6]. Significant progress has been made in the global prevention and treatment of this malignant tumor [10–12].

European Countries and the Implementation of Effective Strategies to Prevent Gastric Cancer

The elimination of *H. pylori* bacteria is considered the most effective in preventing gastric cancer before the development of severe chronic atrophic gastritis [9]. It is expected to reduce mortality rates by 40%. The "search-and-treat" approach, which involves searching for and eliminating *H. pylori* in asymptomatic adults, has been suggested as a cost-effective strategy for reducing the burden of gastric cancer [10]. For screening for *H. pylori* infection, non-invasive diagnostic tests are preferred. Providing a confirmatory test, such as the 13C urea breath test (UBT), for individuals with positive serology may avoid unnecessary exposure to antibiotics in those with past *H. pylori* infection [11]. Pepsinogen testing is another non-invasive option for identifying individuals with precancerous lesions, especially gastric atrophy. However, a recent meta-analysis [12] concluded that pepsinogens have only a moderate diagnostic yield in gastric cancer detection. Thus, large-scale and well-designed prospective studies are encouraged, particularly in countries where the gastric cancer burden is high and prevention efforts are scarce. The recently published European Guide on Quality Improvement in Comprehensive Cancer Control emphasized the need for additional clinical studies to clarify the implementation of population-based *H. pylori* screening and eradication programs for gastric cancer prevention [13].

Are Any of These Strategies for Preventing Gastric Cancer Implemented in Montenegro or Anywhere in Europe?

It is important to emphasize that no country in Europe has yet implemented a strategy for the prevention of gastric cancer, including Montenegro. Additionally, there is no available guidance on how to best implement and evaluate these programs. However, there are attempts, such as the GISTAR clinical trial, which aim to investigate the role of *H. pylori* eradication combined with non-invasive screening for precancerous lesions in the reduction of gastric cancer mortality in a predominantly Caucasian population in Northern and Eastern Europe [3].

Since Slovenia is also one of the European countries with a high incidence and mortality rate from gastric cancer, the EUROHELICAN project [14] was launched last year in this country. The project aims to implement a population-based *H. pylori* "test/search-and-treat" program in young adults (2,000 men and women between the ages of 30 and 34 will be recruited). The long-term effects of the strategy will also be evaluated in middle-aged Latvians (healthy individuals aged 40–64) who were included in the GISTAR study about 10 years ago [3].

We have high expectations for the results of these European projects in terms of their efficiency, feasibility, acceptability, and possible negative effects. The primary aim of our study was to examine the pattern of gastric

cancer deaths in Montenegro between 1990 and 2018, using national mortality statistics and regression methods. Additionally, the national strategy for preventing mortality from this type of cancer in Montenegro was assessed.

Methods

Data Source

The data on gastric cancer cases in Montenegro between 1990 and 2018 were collected using the International Classification of Diseases code 151 from the 9th edition and the code C16 from the 10th edition. Death certificates were the primary data source. The State Statistical Office provided data until 2009, which were unpublished until 1999 and published in the statistical yearbooks of the Institute for Public Health of Montenegro from 1999 to 2009. After 2009, the Institute for Public Health became the data source for causes of death [15]. Population data were obtained from the Statistical Office of Montenegro [16].

Statistical Analyses

The mortality rates were standardized according to the World Standard Population to estimate the overall and gender-specific trends of gastric cancer. The joinpoint regression model was used to analyze the gastric cancer mortality rate and to identify significant changes in the linear time trend. The estimated annual percentage change (EAPC) and the average annual percentage change (AAPC) were used to describe the trend changes. The Joinpoint Software, version 5.0. May 2, 2023, from the Surveillance Research Program of the US National Cancer Institute, was used for the analysis [17]. The regression line was adjusted to the natural logarithm of rates, using the calendar year as an independent variable, to determine the estimated annual percentage change (EAPC). The grid-search method was chosen for the analysis, and the minimum number of observations for points from the end of the series to the first joinpoint was established as 3 and between two joinpoints as 4. The number of joinpoints was set between 0 and 5, and the permutation test facilitated the selection of the most fitting joinpoint model with an overall significance level of 0.05. Additionally, linear and Poisson regressions were applied, and they were both executed in the Statistical Software for Social Sciences SPSS 26 (IBM Corp., Armonk, NY, USA). The data collected for gastric cancer in Montenegro from 1990 to 2018 was identified using the International Classification of Diseases code 151 from the 9th edition and the code C16 from the 10th edition. Death certificates were the primary data source until 2009. The data sources until 2009 were from the State Statistical Office (unpublished data until 1999, and for the period 1999–2009, published in the statistical yearbooks of the Institute for Public Health of Montenegro). For the period after 2009, the data source on causes of death is the Institute for Public Health [15].

Results

For the observed period 1990–2018, a total of 1,180 cases of death due to gastric cancer were registered. The average number of deaths per year was 40.7 for the overall level, 26.6 for men, and 14.7 for women. The average age-standardized rate was 4.4 deaths/100,000 with an almost 2.5 times higher rate in men (6.4/100,000) than in women (2.7/100,000) (Table 1). Joinpoint regression reveals a statistically significant decrease in the age-standardized rate for the overall level, on average by 1.4% per year (AAPC [95% IP] = −1.4 [−2.4 to −0.4]; $p = 0.007$), which was due to a decrease in the age-standardized rate in men with an average annual change of −1.8% (AAPC [95% IP] = −1.8 [−2.9 to −0.6]; $p = 0.003$), while in women the rates are stable ($p = 0.565$) (Table 1; Fig. 1).

The results for age groups indicate that a decline was registered at the overall level and among men as a consequence of the trend of decreasing age-specific rates for the age group 55–64 on average annually by 2% and among men (AAPC [95% IP] = −2 [−3.8 to −0.1]; $p = 0.035$) and for the overall level (AAPC [95% IP] = −2 [−3.7 to −0.3]; $p = 0.026$). Parallelism in trends about gender is not proven (AAPC difference [95% CI] = −1.4 [−3.1 to 0.3]; $p = 0.112$).

Registered changes by joinpoint regression (Table 1) in the number of cases in the form of a decreasing trend for age groups 35–44 (AAPC [95% IP] = −0.4 [−6.3 to −1.6]; $p = 0.002$) and 45–54 (AAPC [95% IP] = −3.1 [−5.0 to −1.2]; $p = 0.003$) and an increasing trend in the age group 75–84 (AAPC [95% IP] = 3.9 [1.4–6.3]; $p = 0.003$) in men led to similar changes in the same age groups at the overall level, but it did not lead to a significant change in the number of deaths from gastric cancer for the observed period for the overall level neither for men (AAPC [95% IP] = 0.003 [−1.1 to 1.1]; $p = 0.960$) nor for women (AAPC [95% IP] = 0.97 [−0.5 to 2.4], $p = 0.173$), nor for the whole population (AAPC [95% IP] = 0.32 [−0.7 to −1.3]; $p = 0.511$). Changes in total levels are not proven by Poisson regression either (Table 1).

Among those who died from gastric cancer, almost a third were aged 65–74 (29%), almost a quarter were aged 55–64 (24.7%), and almost a quarter were aged 75–84 (23.1%), and not a small percentage were aged 35–44 (11.9%) (Table 1; Fig. 2). Joinpoint regression did not reveal a single point in time at which there was a significant change in the trend of dying from gastric cancer in Montenegro, neither for age-standardized rates nor for the number of cases for all studied categories.

Discussion

This study presents the first analysis of the gastric cancer mortality trends in Montenegro. Our results show a constant and stable decline in mortality rates from

Table 1. Descriptive statistics for gastric cancer deaths cases and mortality rate in Montenegro and results of regression analyses for period 1990–2018

	Joinpoint regression for death cases, AAPC (95% CI)	Joinpoint regression for mortality rate, AAPC (95% CI)	Linear regression for mortality rate, B (95% CI)	Poisson regression for death cases, B (95% CI)	Mean ± SD		Overall death cases
					mortality rate	death cases	
M	0.03 (−1.1 to 1.1)	**−1.8* (−2.9 to −0.6)**	**−0.111* (−0.188 to −0.034)**	0.000 (−0.007 to 0.009)	6.4±1.9	26.6±6.7	770
35–44	**−0.4* (−6.3 to −1.6)**	–	**−0.13* (−0.227 to −0.033)**	**−0.043* (−0.090 to −0.004)**	1.23±1.03	2.49±2.36	42
45–54	**−3.1* (−5.0 to −1.2)**	–	**−0.441* (−0.626 to −0.256)**	**−0.036* (−0.061 to −0.01)**	3.31±1.75	8.89±5.47	96
55–64	−0.7 (−2.6 to 1.4)	**−2* (−3.8 to −0.1)**	**−0.446* (−0.996 to −0.104)**	−0.003 (−0.024 to 0.017)	7.89±3.86	24.8±12.4	229
65–74	0.2 (−1.6 to 2.2)	−1.2 (−3.4 to 0.6)	−0.501 (−1.191 to 0.188)	0.002 (−0.013 to 0.017)	7.65±3.17	37.7±15.4	222
75–84	**3.9* (1.4 to 6.3)**	–	0.638 (−0.751 to 2.027)	**0.040* (0.020 to 0.059)**	5.37±3.45	58.1±30.4	156
85+	−0.9 (−3.6 to 2.0)	–	−0.047 (−2.697 to 2.603)	0.002 (−0.046 to 0.052)	0.92±0.95	47.4±57.1	25
F	1 (−0.5 to 2.4)	−0.4 (−1.8 to 1.0)	−0.012 (−0.05 to 0.025)	0.010 (−0.001 to 0.021)	2.7±0.8	14.1±4.7	410
35–44	−1.7 (−4.4 to 1.1)	–	−0.052 (−0.182 to 0.078)	−0.006 (−0.047 to 0.033)	1.37±1.21	2.95±2.85	45
45–54	0.2 (−2.4 to 2.8)	–	−0.003 (−0.134 to 0.128)	0.015 (−0.020 to 0.052)	1.57±1.06	3.79±2.83	44
55–64	−2.4 (−4.8 to 0.1)	–	−0.175 (−0.376 to 0.026)	−0.018 (−0.047 to 0.011)	2.17±1.51	6.27±4.59	63
65–74	**2.6* (0.1 to 5.1)**	–	0.1806 (−0.218 to 0.579)	**0.023* (0.0014 to 0.044)**	4.13±2.47	15.6±8.73	120
75–84	**2.4* (0.1 to 4.9)**	–	0.1818 (−0.567 to 0.931)	**0.028* (0.0061 to 0.050)**	4.03±2.45	29.3±16.2	117
85+	4 (−6.5 to 15.6)	–	−0.178 (−1.271 to 0.913)	0.002 (−0.049 to 0.055)	0.75±0.79	21.6±23.6	21
All	0.3 (−0.7 to 1.3)	**−1.4* (−2.4 to −0.4)**	**−0.056* (−0.101 to −0.01)**	0.003 (−0.002 to 0.010)	4.4±1.1	40.7±9.1	1,180
35–44	**−3.6* (−6.1 to −1.0)**	–	−0.091 (−0.180 to −0.00)	**−0.036* (−0.065 to −0.007)**	2.37±1.82	2.72±2.08	87
45–54	**−1.8* (−3.3 to −0.2)**	–	**−0.213* (−0.314 to −0.11)**	**−0.022* (−0.042 to −0.00)**	4.82±1.94	6.28±2.84	140
55–64	−0.8 (−2.7 to 1.1)	**−2* (−3.7 to −0.3)**	**−0.290* (−0.603 to −0.021)**	−0.006 (−0.026 to 0.013)	10.0±4.65	15.1±7.18	292
65–74	1.1 (−0.8 to 3.0)	−0.2 (−2.6 to 1.6)	−0.100 (−0.556 to 0.355)	0.009 (−0.003 to 0.022)	11.7±4.91	25.3±9.87	342
75–84	**3.1* (1.1 to 5.1)**	0.5 (−1.3 to 2.3)	0.4069 (−0.352 to 1.166)	**0.034* (0.020–0.049)**	9.41±4.74	40.8±16.7	273
85+	−0.4 (−2.9 to 2.2)	–	−0.172 (−1.419 to 1.074)	−0.007 (−0.042 to 0.026)	1.58±1.32	30.6±26.9	46

AAPC, average annual percentage change; B, regression coefficient. *Indicated that AAPC and B are statistically significantly different from zero at a p value <0.05. M, male; F, female.

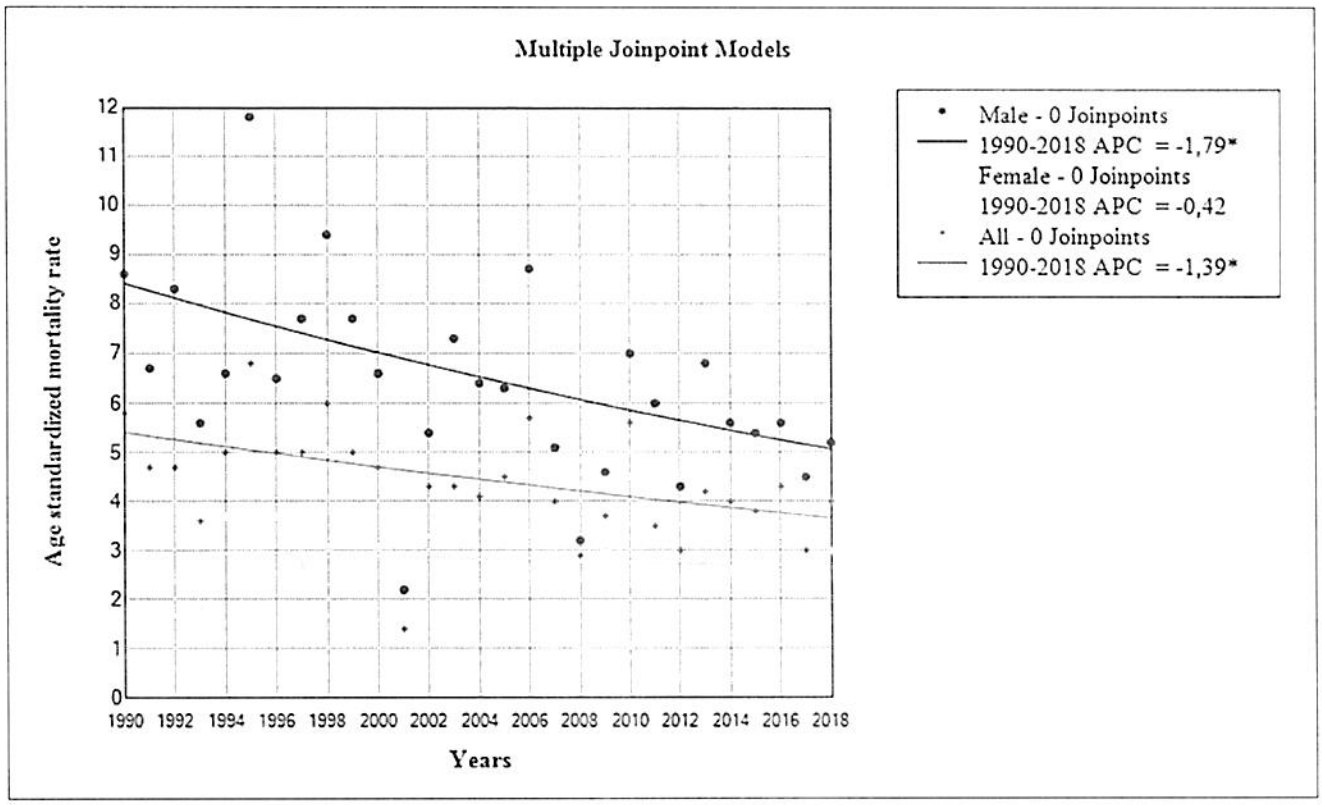

Fig. 1. Joinpoint regression analysis of gastric cancer mortality in Montenegro from 1990 to 2018. APC, annual percentage change. *APC was significantly different from zero $p < 0.05$.

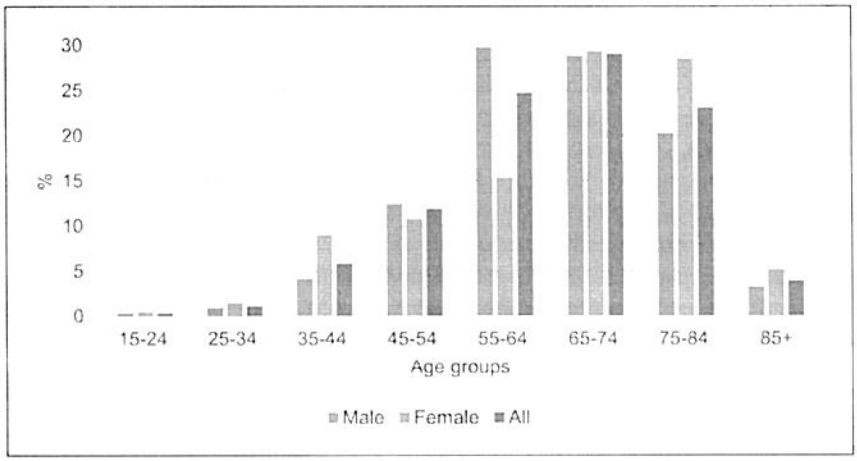

Fig. 2. Distribution of gastric cancer mortality by age groups in Montenegro, 1990–2018.

gastric cancer in Montenegro between 1990 and 2018 which is similar to the global research where death rates from gastric cancer have generally been declining over the last few decades [18–20].

Our data reveal that the average rate of death in Montenegro due to gastric cancer is 4.4/100,000 (6.4/100,000 for men and 2.7/100,000 for women), which is more than 2.5 times lower than the global average rate

(11.8/100,000 for overall, 11/100,000 for men, 4.9/100,000 for women) [18]. The highest death rates from gastric cancer were recorded in East Asia (15.9/100,000), and the lowest in North America (1.8/100,000). High mortality rates were also observed for men and women in Central and Eastern Europe and South America [19].

Montenegro's death rates have seen a significant decrease of about −1.4% per year (1990–2018) for the overall level, and −1.8% for men. The highest average annual percentage decrease was registered in the age group 55–64 for both men and the overall level. In contrast, a drop in mortality rates is registered in both genders and all age groups at the global level for a similar period (1990–2019). At the global level, the average annual decline in men aged between 50 and 69 is about 2.2% [19].

Additionally, in Montenegro, the death rates are significantly higher in men, with the highest death rates registered in the age groups 55–64 and 65–74. In 2019, death rates were higher among men than women worldwide, across all age groups. The highest rates in the world were observed in the older age group of 70 years. Men in South Asia had the highest death rates among age groups 15–49, while men in North Africa and the Middle East had the highest rates for age groups 50–69 and over 70. For women, the highest rates were observed in South Asia for age groups 15–49 and 50–69 years, and in North Africa and the Middle East for the older age group of 70 years [19].

In our study, we found that the maximum decline in death rates was recorded in the age group of 55–64, which is consistent with global findings [19]. Throughout the latter half of the 20th century, the occurrence and mortality rates of gastric cancer dropped significantly across Europe [20]. The EU saw a consistent and gradual decline in mortality rates from gastric cancer between 1980 and 1999 [20], and a further decrease was observed from 2000 to 2005 [21]. In the European Union and other significant European nations, death rates from gastric cancer decreased by approximately 3% each year between 1980 and 2011 [22].

According to the estimates of the World Health Organization and the International Agency for Cancer Research for the year 2020, Montenegro is in 54th place out of 185 countries in terms of gastric cancer mortality rates. The first places in terms of gastric cancer mortality rate are occupied by Mongolia, Kyrgyzstan, Tajikistan, and China [23]. According to earlier research on gastric cancer mortality in the areas of the former Yugoslavia, Montenegro had the lowest rate of the countries in the region [24].

Among the other countries in the region, in Croatia, there has been a noticeable decline in the gastric cancer mortality rate in the male population over different periods of observation (1988–2008), with a decrease of 5% from 1988 to 1995 and 2.5% from 1995 to 2008 [25]. The same mortality rate in the female population decreased by 3.2% from 1988 to 2008. In Serbia, joinpoint regression analysis indicated a significant decrease in mortality rates of gastric cancer from 2000 to 2015, with an annual percent change (APC) of 2.21% per year in men and 1.75% in women [26]. However, from 2015 to 2017, there was a significant increase of 44.5% in mortality rates from gastric cancer in APC in men and 53.15% in women [26].

Moreover, in Serbia, in 2018, the age-standardized mortality rate was 7.40/100,000 men and 3.4/100,000 women [27], while for the same year, the mortality rate in Montenegro was 5.2/100,000 in men and 3.0/100,000 in women, and globally 11.7/100,000 in men and 5.2/100,000 in women [28]. The reasons behind the trend of decreasing death rates in neighboring countries are not yet completely understood [25, 26]. However, it has been suggested that this trend may be linked to the stabilization of the political, economic, and social situation, as well as the introduction of modern diagnostic techniques and more effective treatment methods [26]. Globally, the decrease in gastric cancer can be attributed to a better understanding of its epidemiology, molecular mechanisms, clinical diagnosis, and treatment [4, 29].

Controlling risk factors is an essential part of monitoring this sort of cancer. Studies have shown that eradicating *H. pylori* bacteria can effectively reduce the occurrence of gastric cancer by approximately 50% [30, 31]. According to a review conducted by Ford et al. [32], the risk of developing gastric cancer was 34% lower among individuals who received eradication therapy compared to the control group. However, the sole eradication of the bacteria alone is insufficient. Rather, more attention is being paid to the interaction between dietary habit changes and *H. pylori* control [5, 7]. According to Maastricht VI [33], *H. pylori* eradication may reverse gastric atrophy and, to some extent, intestinal metaplasia (IM) and may halt the progression from chronic atrophic gastritis to neoplastic lesions in a subset of patients.

In China, a population-based study demonstrated that eradicating *H. pylori* is possible and acceptable. However, factors such as missed doses, male gender, smoking, obesity, and alcohol consumption can affect eradication success and should be kept in mind to prevent eradication failure [34, 35]. More attention is being given to identifying patients at higher risk for surveillance of this cancer [30, 36, 37], in order to reduce mortality.

In Montenegro, as in many other countries [36], there are no national guidelines for the diagnosis, treatment, and follow-up of patients who test positive for *H. pylori*. As a result, we rely on the official recommendations provided in 2022 entitled "Management of *Helicobacter pylori* infection: the Maastricht VI/Florence consensus report" [33] for treatment guidance. In addition, for follow-up of endoscopically and pathophysiologically verified precancerous lesions, we refer to the revised recommendations published in 2019 by the "Management of epithelial precancerous conditions and lesions in the stomach (MAPS II): European Society of Gastrointestinal Endoscopy (ESGE), European Helicobacter and Microbiota Study Group (EHMSG), European Society of Pathology (ESP), and Sociedade Portuguesa de Endoscopia Digestiva (SPED) guideline update 2019 [38]. Based on current evidence [33], it is recommended to integrate population-based *H. pylori* test-and-treat programs into healthcare priorities, especially in regions with high gastric cancer incidence (ASR greater than 20/100,000). In Montenegro, the standardized incidence rate of gastric cancer is 12.3/100,000 for men and 3.6 for women [39], and the optimal time to start screening remains uncertain. To prevent early preneoplastic changes in the gastric mucosa and therefore gastric cancer, the test-and-treat *H. pylori* program is suggested to focus on individuals aged 20–40. The first testing line should involve the detection of anti-*H. pylori* IgG antibodies in serum by using an enzyme-linked immunosorbent assay (ELISA). A stool *H. pylori* antigen test may be used as a confirmatory test, as the urea breath test is currently not available in Montenegro. Performing a confirmatory test is crucial to avoid unnecessary use of antibiotics. When selecting antibiotics, it is important to avoid using those necessary for treating life-threatening infections in the community, particularly in regions with a high rate of clarithromycin resistance (more than 15%). There has not been any research on clarithromycin resistance in Montenegro, so this recommendation can also be applied to our country. This gastric cancer screening strategy proposal could be implemented with existing resources in Montenegro. Additionally, it would be essential to implement 13C-UBT in Montenegro. It is also important to determine the resistance to clarithromycin to select antibiotics with minimal antibacterial resistance development and determine the most adequate eradication regimen for *H. pylori*-positive individuals. Follow-up treatment to confirm eradication success should be incorporated and evaluated based on feasibility and cost-effectiveness in our country. Results from ongoing large randomized clinical trials – GISTAR and EUROHELICAN – are eagerly awaited as they are expected to provide important insights into surveillance. In addition, it is uncertain whether to introduce and perform serological screening in Montenegro with the determination of serum pepsinogen I and II (sPG-I and sPG-II) including the calculation of the sPG-I/II ratio in combination with the analysis of anti-*H. pylori* antibodies, as this requires additional analysis in terms of cost justification. Moreover, the introduction of serological tests for the detection of atrophic gastritis would increase the number of upper gastrointestinal endoscopies for all patients with positive serologic biopsies. These are questions that require clear answers soon in Montenegro to reduce the frequency of gastric carcinoma.

The control of gastric malignancy poses a new challenge. However, introducing a prophylactic vaccine against *H. pylori* may be a good future solution [40, 41]. This vaccine is not yet available on the market [41].

Other preventable risk factors include smoking, alcohol consumption, changes in food preparation, exposure to radiation, obesity, and consumption of fruits and vegetables [6, 29, 42, 43]. In high-risk Asian countries, reducing the intake of foods with high salt content is one of the proposed ways to solve the problem of gastric malignancy [44]. The most effective ways to prevent gastric malignancy are changes in diet and lifestyle, especially in the developed world [6]. For instance, in Japan, where there is a decrease in mortality, mandatory screening for gastric cancer and a change in eating habits, such as an increased intake of fresh, unprocessed fruits and vegetables, have contributed to this decrease [45].

Recently, new diagnostic modalities have led to higher diagnostic rates in the identification of precancerous conditions and early gastric cancer using image-enhanced endoscopy. In the Clinical Center of Montenegro in Podgorica, we use high-resolution endoscopy with chromoendoscopy to diagnose gastric precancerous conditions and early neoplastic lesions and guide biopsy for atrophic and metaplastic changes in the mucosa. Endoscopic ultrasonography (EUS) can be a helpful tool in identifying infiltrated regions of the gastric wall. Unfortunately, EUS is not currently available in Montenegro. However, since most endoscopists in other cities in Montenegro are not yet familiar with advanced imaging techniques, we currently cannot recommend exclusively endoscopic staging of gastritis without biopsy. Further education of endoscopists is necessary. Additionally, not all pathologists in

Montenegro use systems for histopathological staging (e.g., operative link on gastritis assessment [OLGA] and operative link on gastric intestinal metaplasia assessment [OLGIM]) to identify patients with advanced stages of atrophic gastritis. Improving diagnostics from this aspect is also necessary.

Laparoscopic surgery is used in Montenegro for treating early gastric cancer. It offers potential benefits, such as decreased postoperative morbidity and reduced recovery time. With technical advances, future gastric cancer surgery is expected to become increasingly minimally invasive and will likely take advantage of the rapidly developing robotic technologies [46].

Conclusions

Through the offered analysis, we found that in Montenegro there is a tendency to decline in age-standardized mortality rates from gastric cancer for men and the overall level, at the expense of the decline in age-standardized rates in the age group 55–64 and for men and the overall level, without changes in the rate in women. Specific national strategies are warranted to further reduce mortality from this cancer. The main goals of such strategies should be the control of risk factors that have already been proven to increase the incidence and mortality of gastric cancer (such as smoking, excessive alcohol consumption, and diet), as well as interventions such as eradication of *H. pylori* infection, early detection of suspected cases, and improved access to standard treatment. The study of trends by individual categories, such as gender and age groups, represents a very important aspect of the assessment of the burden of gastric cancer as well as the formulation and implementation of preventive strategies. Also, trend research can help in monitoring effects of those strategies.

Statement of Ethics

Ethical approval and consent were not required as this study was based on publicly available data.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Mirjana Nedović Vuković, MD: conceptualization, data curation, formal analysis, investigation, methodology, validation, writing – original draft, and writing – review and editing; Marina Jakšić, MD and Dr. Brigita Smolović, Prof.: writing – original draft, and writing – review and editing; Miloš Lukić, MD: writing – review and editing; and Zoran Bukumirić: formal analysis and methodology.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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Mortality trend of cutaneous melanoma in Montenegro from 1990-2018

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Abstract. – OBJECTIVE: Every year, melanoma claims over 20,000 lives in Europe. In Montenegro, as in Europe, numerous campaigns have been initiated to raise public awareness about the importance of melanoma prevention and its early detection. Thus, accompanying current diagnostic and therapeutic protocols, new methods of melanoma diagnosis and treatment have been implemented. Studying the trend enables the identification of the groups most burdened by mortality and assesses whether there has been a change in trends based on interventions aiming to reduce mortality. The objective of this study is to evaluate the mortality trend from cutaneous melanoma in Montenegro for the period 1990-2018.

MATERIALS AND METHODS: We have utilized national data on the causes of death from melanoma, code 179 from the ninth and C43 from the tenth revision of the International Classification of Diseases, categorized by gender and age groups. The study utilized various regression techniques, including Joinpoint regression in the Joinpoint Program, Poisson regression, and linear regression in the SPSS 26th Program, to describe the trend.

RESULTS: In Montenegro, during the period from 1990 to 2018, a total of 281 individuals died (51.6% male and 48.4% female). This ranks as the 13th leading cancer in terms of mortality among all cancers. The average age-standardized rate was 1.1 deaths per 100,000 (1.2 for males and 1.0 for females). The number of death cases has been increasing on average by 3.3% annually [average annual percentage change (AAPC) (95% CI) = 3.3 (1.7-4.9); $p<0.001$] on an overall level and by 5.4% annually among males [AAPC (95% CI) = 5.4 (3.6-7.3); $p<0.001$] due to the rises in the age groups 55-64 years and 65-74 years with an average annual percent change of respectively 3.2% [AAPC (95% CI) = 3.2 (0.8-5.8); $p=0.012$] and 5.4% [AAPC (95% CI) = 5.4 (2.7-8.1); $p<0.001$] overall level, and 4.8% [AAPC (95% CI) = 4.8 (2.4-7.3); $p<0.001$] and 7.5% [AAPC (95% CI) = 7.5 (4.9-10.2); $p<0.001$] among males. For females, an increase of 1.1% was recorded, which was not statistically significant [AAPC (95% CI) = 1.1 (-0.8-3.0); $p=0.255$]. Furthermore, there was a noted increase in the rates at an overall level [β (95% CI) = 0.027 (0.008-0.046); $p=0.007$] and in the age group 65-74 years [β (95% CI) = 0.249 (0.090-0.407); $p=0.003$], as well as among males at an overall level [β (95% CI) = 0.052 (0.025-0.079); $p<0.001$] and for age groups 45-54 years [β (95% CI) = 0.102 (0.011-0.193); $p=0.030$] and 65-74 [β (95% CI) = 0.410 (0.144-0.676); $p=0.004$]. In contrast, the rates for females remained constant. The three age groups most burdened by melanoma skin cancer mortality are 65-74 years (23.5%), 55-64 years (21.7%) and 75-84 years (19.2%).

CONCLUSIONS: The results of regression analyses indicate a significant rise in both the number of death cases and mortality rates overall, specifically among males in Montenegro. In females, however, the increase in the number of death cases and rates is not statistically significant. Preventive campaign activities should be redirected towards the most vulnerable groups in terms of mortality, namely males and the elderly population.

Key Words:
Cutaneous melanoma, Mortality trend, Developing country, Montenegro.

Introduction

Melanoma is the most malignant skin cancer, possessing the highest mortality rate[1]. According to GLOBOCAN data[2], in 2020, a total of 57,043

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death cases from melanoma were reported worldwide, constituting less than 1% of all cancers, with an age-standardized rate of 0.7 in men and 0.4 in women globally. The majority of deaths occurred in Central and Western Europe, East Asia, and South America[3]. Annually, melanoma claims over 20,000 lives in Europe[4]. It is responsible for 1.4% of all cancer-related deaths documented in Europe in 2018[5]. The data from the last decade suggest that, in Montenegro, melanomas account for about 1.4% of all cancer-related deaths[6]. There are pronounced variations in the burden of melanoma across different populations. The analyses suggest that the most substantial melanoma burden is predominantly observed in Australian, North American, and European demographics, with a particular emphasis on the elderly and male cohorts[7-10]. Prolonged exposure to ultraviolet radiation from sunbathing and indoor tanning is identified as a primary risk factor for melanoma onset[11]. Other risk factors for melanoma include having an invasive skin melanoma in one or more first-degree relatives, a history of primary invasive skin melanoma, more than a hundred benign melanocytic nevi, three or more clinically atypical (dysplastic) nevi, fair skin (type 1 or 2), red or blue hair, one or more severe sunburns with blistering, use of tanning beds (especially before the age of 30), and exposure to pesticides[12]. To combat this cancer, population-based strategies have been implemented to reduce its incidence through prevention. The prevention strategies range from primary prevention methods, such as reducing sun exposure and implementing stricter labeling protocols for sunscreens[13,14], to secondary prevention methods like full-body skin visual exams[15].

The disparities in incidence and early diagnosis across Europe are tied to notable differences in public awareness and the availability of primary and secondary prevention campaigns. Nordic and Western European countries have several decades-long traditions of public education campaigns for preventing and detecting skin cancers[15-19].

Early diagnosis of melanoma is pivotal in enhancing survival rates[20,21]. Hence, globally, self-skin examinations are promoted, along with clinics for pigmented lesions that expedite the monitoring of patients suspected of having melanoma[22-24]. Since 2013, Montenegro, as a member of the most famous European melanoma prevention and screening campaign, Euromelanoma[25], has been carrying out actions to raise awareness at the national level about skin malignancies with an emphasis on melanoma. The main goal of these campaigns is to educate the general public about melanoma risk factors and the importance of recognizing abnormal lesions by self-examination. All specialties related to dermatopathology are included in the campaign: dermatologist, plastic surgeon, pathologist, family doctor, general practitioner, oncologist, nuclear medicine specialist. Additionally, with the goal to improve data collection as a part of the Euromelanoma project, the first National Registry of Melanoma Patients is being developed. In recent years, Montenegro has also introduced novel diagnostic and treatment methods for melanoma.

This study aims to assess melanoma mortality (overall, by gender, and by age groups) in Montenegro from 1990-2018 by using regression techniques. Such analyses alert countries experiencing an increasing trend in skin malignancies to take action in mitigating the malignancy load and thereby reducing its overall burden[9]. It can also aid in evaluating the effectiveness of new diagnostic, therapeutic and preventive strategies[26]

Materials and Methods

Data Sources

The data concerning melanoma mortality in Montenegro from 1990 to 2018 were collected. Melanoma was identified using the International Classification of Diseases code 172 from the 9th edition and code C43 from the 10th edition[27]. The primary data source consists of death certificates filled out by physicians who determine the time and cause of death. Ethical approval and consent were not required as this study was based on publicly available data. The data sources until 2009 were from the State Statistical Office (unpublished data until 1999, and for the period 1999-2009 published in the statistical yearbooks of the Institute for Public Health of Montenegro[28]. For the period after 2009, the data source on causes of death is the Institute for Public Health[6]. Population data were sourced from the Statistical Office of Montenegro (available at: https://www.monstat.org/cg/page.php?id=48&pageid=48). Mortality rates were age-standardized to the World Standard Population[29] for estimating both the overall and gender-specific trends.

Statistical Analyses

The joinpoint regression model scrutinized long-term shifts in melanoma mortality and identified significant changes in the linear time trend. In this model, the dependent variable x represents

the year, while the independent variable y symbolizes the log-transformed mortality rate. These models also offered insights into the estimated annual percentage change (EAPC) and the average annual percentage change (AAPC) of melanoma mortality rates. Analyses were executed using the Joinpoint Software, version 5.0.2-May, 2023, freely available on the website of the National Cancer Institute of the United States of America[30]. The natural logarithm of the Age standardized death rate (ASDR) was fitted to a regression line, ln ASDR = $\alpha + \beta x + \varepsilon$, where x denotes the calendar year. The EAPC was computed as $100 \times [\exp(\beta)-1]$, and its 95% confidence interval (CI) was also derived from the linear regression model[9,30]. To determine the EAPC, the regression line was adjusted to the natural logarithm of rates, using the calendar year as an independent variable. The Grid-search method was chosen for the analysis. The minimum number of observations for points from the end of the series to the first joinpoint was established as 3 and between two joinpoints as 4. The number of joinpoints was set between 0 and 4. The permutation test facilitated the selection of the most fitting joinpoint model with an overall significance level of 0.05. Gender differences were assessed using the parallelism test[31]. Beyond the joinpoint regression, both linear and Poisson regressions were applied. They were executed in the Statistical Software for Social Sciences SPSS 26 (IBM Corp., Armonk, NY, USA).

Results

From 1990 to 2018, Montenegro recorded a total of 281 deaths (145 males or 51.6% and 136 females or 48.4%) from melanoma, making it the 13th most common cause of cancer-related mortality for the observed period. The average annual death count was 9.7 (5.0 males and 4.7 females), with the average age-standardized rate being 1.1 (1.2 for males and 1.0 for females). The rates were approximately 1.07 times higher among males (Table 1).

Due to low values, with certain years recording rates of 0 or close to 0, the joinpoint regression could not have been executed for age-standardized rates, neither overall nor gender-specific.

The outcomes derived from the joinpoint regression analysis pertaining to death cases indicate an average annual increase of 3.3% [AAPC (95% CI) = 3.3 (1.7-4.9); $p<0.001$] at an overall level and 5.4% annually among males [AAPC (95% CI) = 5.4 (3.6-7.3); $p<0.001$]. The increase was recorded within age groups 55-64 years and 65-74, with average annual percent changes of 3.2% [AAPC (95% CI) = 3.2 (0.8-5.8); $p=0.012$] and 5.4% [AAPC (95% CI) = 5.4 (2.7-8.1); $p<0.001$] respectively for the overall population, and 4.8% [AAPC (95% CI) = 4.8 (2.4-7.3); $p<0.001$] and 7.5% [AAPC (95% CI) = 7.5 (4.9-10.2); $p<0.001$] among males. Among females, an increase of 1.1% has been recorded, which is not statistically significant [AAPC (95% CI) = 1.1 (-0.8-3.0); $p=0.255$]. For males in the age group 45-54 years, a breakpoint emerged in 2011. From 1990-2011, the mortality count increased annually by an average of 7.5% [AAPC (95% CI) = 7.5 (3.5-11.7); $p=0.001$], subsequently followed by a pronounced decline of 13.2% from 2011-2018. While this decrease was not statistically notable for the observed period, it rendered the trend for this overall age group statistically insignificant (Table 1, Figures 1 and 2). The parallelism test results suggest that the mortality trend by gender is not parallel and that male mortality rates escalate 4.3 times faster [final selected model: AAPC difference (95% CI) = 4.3 (1.8-6.9); $p=0.001$].

Employing linear regression, we observed an increase in rates at an overall level [β (95% CI) = 0.027 (0.008-0.046); $p=0.007$] and in the age group 65-74 years [β (95% CI) = 0.249 (0.090-0.407); $p=0.003$], as well as among males at an overall level [β (95% CI) = 0.052 (0.025-0.079); $p<0.001$] and for age groups 45-54 years [β (95% CI) = 0.102 (0.011-0.193); $p=0.030$] and 65-74 years [β (95% CI) = 0.410 (0.144-0.676); $p=0.004$]. Conversely, the female rates remained stable (Table 1).

Poisson regression allows us to discern the trend pattern in contexts where there is a limited number of cases per unit of time, as is the case with mortality due to skin melanoma. By utilizing this method, we additionally recorded an increase in mortality cases among women aged 65-74 years [β (95% CI) = 0.047 (0.004-0.090); $p=0.032$]. Similar increases were observed in the age group 35-44 years [β (95% CI) = 0.080 (0.009-0.151); $p=0.028$] and 45-54 for males [β (95% CI) = 0.066 (0.012-0.121); $p=0.018$] (Table 1).

The three age groups most burdened by skin melanoma mortality are 65-74 years (23.5%), 55-64 years (21.7%), and 75-84 years (19.2%). Notably, a significant percentage of melanoma skin cancer deaths is recorded among the age group 35-44 (11.0%) and 25-34 years (4.3%) (Figure 3). The average rates for these groups are detailed subsequently (Table 1).

Table I. Descriptive statistics of death cases and mortality rate and results of regression analyses of skin melanoma mortality in Montenegro for the period 1980-2018

C43	Joinpoint regression for death cases	Linear regression for mortality rate	Poisson regression for death cases	Mortality rate mean±sd	Death cases mean±sd	Death cases overall number for 1980-2018
	AAPC (95%CI)	β (95% CI)	β (95% CI)			
Male	5.4* (3.6-7.3)	0.052* (0.025-0.079)	0.060* (0.039-0.081)	1.2±0.7	5±3.5	145
25-34						6
35-44		0.067 (-0.009-0.143)	0.080* (0.009-0.151)	1.22±1.73	0.52±0.74	15
45-54	1.9 (-3.2-7.4)	0.102* (0.011-0.193)	0.066* (0.012-0.121)	1.85±2.14	0.76±0.91	22
55-64	4.8* (2.4-7.3)	0.133 (-0.007-0.273)	0.053* (0.014-0.093)	3.99±3.22	1.34±1.23	39
65-74	7.5* (4.9-10.2)	0.410* (0.144-0.676)	0.104* (0.055-0.153)	5.55±6.71	1.17±1.51	34
75-84		(-0.209) (-0.790-0.371)	0.026 (-0.02-0.073)	10.64±12.64	0.93±0.99	27
85+						2
Female	1.1 (-0.8-3)	0.003 (-0.018-0.024)	0.013 (-0.006-0.034)	1.0±0.5	4.7±2.1	136
25-34						6
35-44		(-0.014) (-0.087-0.059)	0.000 (-0.061-0.062)	1.27±1.58	0.55±0.69	16
45-54		(-0.015) (-0.120-0.091)	0.018 (-0.037-0.074)	1.77±2.28	0.69±0.89	20
55-64		0.011 (-0.095-0.115)	0.030 (-0.021-0.082)	2.14±2.27	0.76±0.83	22
65-74		0.118 (-0.082-0.318)	0.047* (0.004-0.090)	4.21±4.43	1.10±1.17	32
75-84	0.2 (-2.2-2.6)	(-0.02) (-0.305-0.266)	0.018 (-0.026-0.064)	6.98±6.16	0.93±0.75	27
85+		(-0.115) (-0.982-0.752)	0.006 (-0.062-0.074)	13.48±18.71	0.45±0.63	13
All	3.3* (1.7-4.9)	0.027* (0.008-0.046)	0.036* (0.022-0.051)	1.1±0.5	9.7±4.7	281
25-34	1.1 (-0.8-3.1)	0.011 (-0.017-0.040)	0.017 (-0.050-0.086)	0.45±0.80	0.03±0.49	12
35-44	2.8 (-0.2-5.9)	0.027 (-0.026-0.080)	0.018 (-0.023-0.061)	1.24±1.50	0.75±0.85	31
45-54	2.5 (-0.5-5.5)	0.043 (-0.028-0.113)	0.034 (-0.002-0.071)	1.81±1.99	0.99±1.09	42
55-64	3.2* (0.8-5.8)	0.072 (-0.021-0.165)	0.039* (0.008-0.070)	3.05±2.66	1.44±1.36	61
65-74	5.4* (2.7-8.1)	0.249* (0.090-0.407)	0.071* (0.038-0.102)	4.85±5.16	1.53±1.68	66
75-84	0.5 (-1.8-2.8)	(-0.082) (-0.374-0.209)	0.019 (-0.012-0.051)	8.68±8.93	1.26±1.06	54
85+	0.3 (-1.8-2.5)	0.071 (-0.494-0.635)	0.009 (-0.051-0.070)	9.16±16.43	0.37±0.58	15

*Statistically significant change in mortality trend

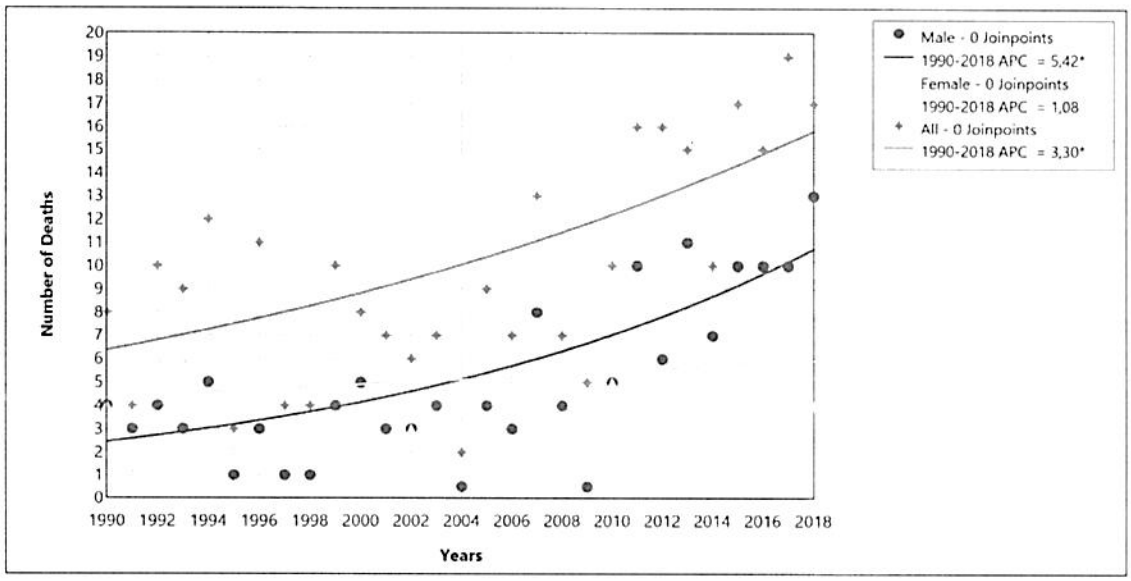

Figure 1. Joinpoint regression analysis of overall and gender skin melanoma mortality in Montenegro from 1990 to 2018. APC-Annual Percentage Change; *APC was significantly different from zero $p<0.001$.

Discussion

This study outlines the mortality trends from melanoma in Montenegro for the period from 1990 to 2018. The results of regression analyses indicate that there is a significant increase in both the number of deaths and mortality rates for the entire population and males in Montenegro as well. However, for females, neither the growth in the number of cases nor the rate proves statistically significant. On a global level, while the number of cases is increasing by 90% compared to 1990,

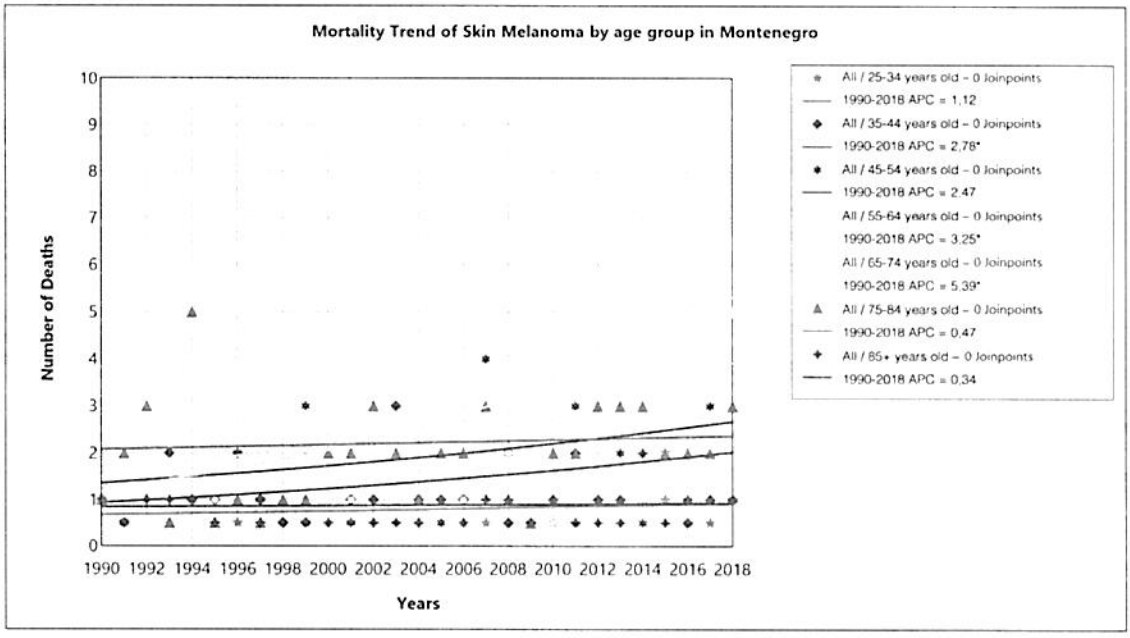

Figure 2. Joinpoint regression analysis of skin melanoma mortality by age groups in Montenegro from 1990 to 2018. APC-Annual Percentage Change, *APC was significantly different from zero $p<0.001$.

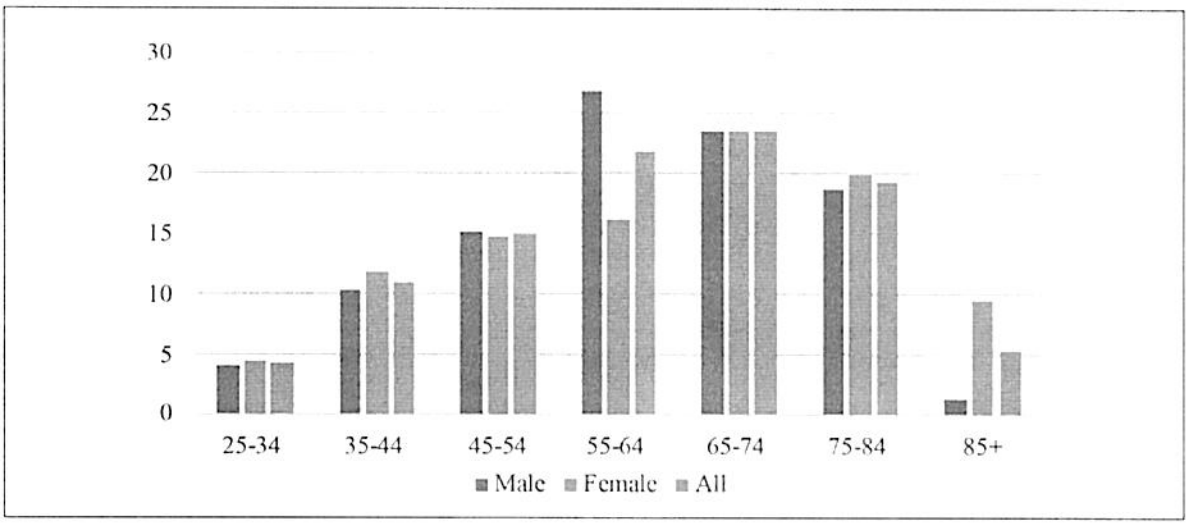

Figure 3. Distribution of skin melanoma mortality by age groups in Montenegro, 1990-2018.

age-standardized rates reveal a declining trend from 1990 to 2019 (EAPC in ASDR = -0.27). These rates are decreasing for the entire population, males and females alike[9].

In 2018, the melanoma mortality rate in Montenegro was 1.6/100,000. The average rate for the studied period was around 1.1 cases per 100,000, which is significantly lower than the highest rates recorded in countries like New Zealand (5.2/100,000) and Australia, Norway, North Macedonia, and Sweden (greater than 3/100,000). Conversely, it is considerably higher than the world's lowest rates found in Mongolia, Egypt, Sri Lanka, and India (less than 0.2/100,000)[9].

Although globally, age-standardized mortality rates exhibit a declining trend, 102 countries have shown an upward trajectory in ASDR. Guatemala witnessed the most significant increase in ASDR (EAPC = 3.9, 95% CI: 3.1-4.6), followed by Belarus and Greece[9].

In Montenegro, the rates among men in 2019 were 3.7 times higher than women, which is double the global rate, where the ratio was at 1.56 for the same year. Age-specific melanoma mortality rates in Montenegro peak in individuals aged above 75 years. This partially aligns with global findings, wherein the prominent mortality rates manifest in those aged over 70 years, particularly among males[9].

In Montenegro, the number of deaths is increasing in the 55-74 age group, with a particularly pronounced increase in both the number of cases and rates for those aged 65-74 years, encompassing the total population and males. Globally, for the observed period from 1990 to 2019, mortality rates demonstrate a declining trend for age groups younger than 80 years, especially among individuals aged 30 to 49 years. However, there is an upward trend among the population older than 80.

Over the past decade, public health systems have promoted multiple primary and secondary prevention strategies that might be responsible for the mild reduction in mortality rates, especially in younger age groups[9].

The further decrease may be associated with advancements in healthcare and medical technology, such as early detection through skin cancer examinations using superior diagnostic tools and the approval of immunotherapy and molecularly targeted treatments for advanced melanoma[32-34].

Mortality trends from melanoma vary significantly worldwide[9] and depend on geographical location, ethnicity, age, and gender[35-38].

Considering the global burden of melanoma, Europe remains one of the most affected regions[9,39,40]. Mortality rate estimates in Europe show minimal variations among countries, ranging from the lowest at 1.1 ASDR in Malta to 3.5 ASDR in Norway, with an average of 1.7 for EU + EFTA countries. Mortality rates are universally higher for males than females, spanning Europe from 0.9 to 2.8 for females and 1.3 to 4.2 for males. Nordic countries and Switzerland display the most substantial gender disparity in mortality rates, peaking in Finland (1.1 for females *via* 2.9

for males). Mortality due to melanoma claims over 20,000 lives in Europe annually. From 1985 to 2015, the countries manifesting a consistent rise in ASDR from melanoma for both genders in Europe were Estonia, Latvia, Lithuania, Norway, the UK, the Republic of Moldova, Serbia, Slovakia, Croatia, Italy, Slovenia, Belgium, Japan and the Republic of Korea.

The Czech Republic, Macedonia, and Switzerland displayed a decreasing trend in male mortality rates. Austria, Denmark, Finland, Hungary, Switzerland, and Macedonia exhibited declining trends in female mortality rates. For men, the highest AAPC in mortality rates from 2005-2015 was recorded in Ireland (+5.3%), the Republic of Korea (+4.4%) and Lithuania (+3.0%), whereas the negative AAPC was observed in Australia, the Czech Republic, Macedonia, Romania, and Switzerland. Among women, Croatia registered the highest AAPC (+1.8%), whereas the negative AAPC was noted in the Czech Republic, Macedonia, Sweden, Hungary, Switzerland, Austria, Finland, Spain, and Denmark.

The highest ASDR for both genders was documented in Norway (4.55 per 100,000 for men and 3.02 per 100,000 for women) and Slovenia (3.86 per 100,000 for men and 2.58 per 100,000 for women)[26]. Norway, Sweden and the Netherlands rank among the top five for ASDR of melanoma in Europe[9]. In Eastern and Southeastern European countries, including Montenegro, mortality rates are relatively consistent, but mortality trends vary. For the middle age group (50-69 years), mortality trend investigations display disparity among countries, with decreasing trends in countries like the Czech Republic and Slovakia but ascending trends in others, peaking for men in Serbia (AAPC 3.6%) and for women in Slovenia (AAPC 6.0%). The oldest age groups consistently show significant mortality increases in both genders, up to an 8% AAPC in Serbia[41].

Across Europe, a significant increase in survival rates has been recorded[42,43]. It has exceeded 90% for a five-year relative rate in Nordic or Western countries but remains below 60% in Eastern Europe for individuals diagnosed in this decade[44].

This can be partly attributed to novel advanced melanoma treatment modalities[45,46]. A study[47] conducted in the US demonstrates an association between the introduction of new systemic therapies and a sudden decline in melanoma mortality. Countries that approved this therapy later, such as Spain, subsequently recorded a decline in mortality[48]. Although innovative, effective therapies were introduced in European countries from 2012 to 2015, access to them is highly inconsistent across the continent[49].

In Montenegro, therapeutic options have been expanded. Both immunotherapy and combination therapy are being used. As a first-line treatment in immunotherapy, Pembrolizumab has been utilized since 2017. Depending on the *BRAF* status, combination therapy is also employed (drugs: Trametinib used from 2017, Dabrafenib used from 2017 Vemurafenib used from 2013, Cobimetinib used from 2017). The combination therapy can also be considered as a first-line treatment. If the BRAF status is negative, chemotherapy is administered following immunotherapy. Numerous primary and secondary prevention campaigns were initiated in the 1980s or at the beginning of the 21st century[50-52]. The most renowned campaign for Europe is the Euromelanoma Plan, which commenced in 1999[25]. Germany launched a national melanoma screening program (the SCREEN Project) in 2008[53], but its implementation has yet to achieve significant shifts in mortality rates[44,54,55].

In recent years, Montenegro has been conducting national-level awareness-raising initiatives. Annually, in May, as part of the Euromelanoma campaign, free skin examinations for the public are organized under various slogans (for 2023, the slogan was "Are you protected from the sun"). Additionally, the Montenegrin population has access to the Euromelanoma website at https://www.euromelanoma.eu/cnr-me/, translated into the native language, providing information on melanoma prevention, detection and treatment.

Globally, fervent research efforts are underway to advance diagnosis to earlier stages, prevent the onset, and develop groundbreaking treatments. One objective of analyzing epidemiological data and trends is to capture the early indications of the success of these initiatives through changes in melanoma incidence or mortality[44].

Conclusions

Despite the measures undertaken in recent years aimed at mitigating melanoma, no change in the mortality trend has been observed. In Montenegro, both the number of melanoma death cases and the mortality rates are significantly increasing, both at the overall level and among males. However, the increase in the number of death cases and the mortality rate is not statis-

tically significant for females. Preventive campaign efforts should be redirected towards the most vulnerable groups in terms of mortality, namely males and the older population.

Authors' Contributions

Conceptualization: M. Nedovic Vukovic, Z. Bukumiric. Data curation: M. Nedovic Vukovic, Z. Terzic. Formal analysis: M. Nedovic Vukovic, M. Golubovic, Z. Terzic. Investigation M. Nedovic Vukovic, M. Golubovic. Methodology: M. Nedovic Vukovic, Z. Bukumiric. Supervision: Z. Terzic, M. Golubovic. Visualization: M. Bojic. Writing – original draft: M. Nedovic Vukovic. Writing – review & editing: M. Nedovic Vukovic, Z. Terzic, M. Golubovic.

Conflict of Interest

The authors have no conflict of interest to declare.

Data Availability

All data generated or analyzed during this study are included in this published article.

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No ethical approval or consent was necessary, as this study relied on publicly available data.

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Trends in oesophageal cancer mortality in Montenegro, 1990–2018

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Background: Oesophageal cancer (OC) is a significant public health issue, despite the decreasing trends in OC mortality rates observed globally in the past decades. The objective of our study is to analyze the pattern of OC mortality in Montenegro between 1990 and 2018 and contribute to the development of a national long-term strategy for the prevention and control of this malignancy. **Methods:** The data on OC death cases in Montenegro between 1990 and 2018 were collected. The mortality rates were standardized according to the World Standard Population. The Joinpoint, Linear and Poisson regressions were applied to analyze the OC mortality trend. **Results:** Joinpoint regression analysis showed an increase in death rates for men and the overall level which were not statistically significant. However, the number of cases increases significantly with an average annual percentage change (AAPC) increase of 2.6% for the overall level [AAPC (95% CI)=2.6 (1.0–4.2); $P = 0.002$] at the expense of the increase in men, which on average was 2.6% annually [AAPC (95%CI) = 2.6 (1.2–4.1); $P = 0.001$]. The age groups 55–64 and 65–74 have the highest percentage of deaths cases from OC with 30.6% and 31.4%, respectively. **Conclusion:** Montenegro has witnessed a recent increase in the number of deaths from OC, although the mortality rates remain stable. National strategies to further reduce mortality rates for OC are necessary. Individuals aged 55–64 and 65–74 need specific attention during the ongoing monitoring of this cancer.

Introduction

Oesophageal cancer (OC) is the sixth leading cause of death worldwide, with 544 076 deaths recorded in 2020, out of which 374 313 were men and 169 763 were women. It accounts for 1 in every 18 cancer-related deaths. Around 70% of the cases occur in men, and there is a 2–3 times higher mortality rate in men than women. The mortality rates are higher in developed countries for men, but comparable for women.[1–3]

In 2019, mortality rates for men were 9.68, while for women were 3.02.[4,5] OC has shown a downward trend in mortality globally from 1990 to 2019, although the burden of the disease varies greatly by region and country.[3–5] It is the most geographically differentiated tumour.[4] The two main histological subtypes of OC are adenocarcinoma (EAC) and squamous cell carcinoma (SCC), and the risk factors vary depending on the type.[6]

OC is a complex and multifactorial disease, with different types of cancer having distinct risk factors.[5,7,8] For instance, SCC is more prevalent in males, individuals with a family history of the disease, smokers, frequent alcohol consumers and those with specific dietary habits.[7] Additionally, low socioeconomic status, exposure to nitrosamines and the consumption of very hot beverages can heighten the risk of developing oesophageal SCC.[8] Moreover, deficiencies in vitamin C, vitamin E and folate can also increase the risk of SCC.[9] However, smoking and alcohol consumption remain the two most significant risk factors, accounting for over 70% of all SCC cases in high-income regions.[10] For instance, in China, drinking hot tea, excessive alcohol consumption and smoking are the principal causes of high OC morbidity.[11] On the contrary, EAC is more closely linked with gastro-oesophageal reflux disease (GERD), obesity and high blood cholesterol, while smoking and alcohol consumption are more associated with SCC among men.[5] It has been observed that African countries, especially West Sub-Saharan Africa, have a higher burden of OC due to their diet being low in iron, magnesium, zinc and selenium.[12,13] Obesity and GERD are two major risk factors for EAC, along with Barrett's oesophagus (BE), which is a well-known premalignant condition.[8,14–17] Patients with BE have a risk of developing EAC that is 30–40 times greater than in the general population. Almost 86% of patients with EAC have a history of BE.[18]

Fortunately, advancements in diagnostic technology and treatment have likely contributed to reduced mortality rates in many countries.[6]

Montenegro follows the latest recommendations for GERD treatment.[19,20] European Society of Gastrointestinal Endoscopy (ESGE) guidelines from 2023 are used for dysplasia diagnosis and follow-up in BE.[19] According to ESGE guidelines as of 2023, BE or EAC screening is not provided in Montenegro, due to the low level of risk in the general population.[19]

Experts have suggested that screening will play a crucial role in preventing OC and reducing mortality in the future.[9,21,22] Currently, there are no established guidelines for screening for SCC of the oesophagus.[9,22] However, guidelines for EAC have been established, but they still lack concrete evidence in the form of randomized controlled trials comparing the implementation of screening and non-implementation of screening.[9,23]

The study aims to analyze the mortality trends associated with OC in Montenegro from 1990 to 2018 using national mortality data and regression techniques. Additionally, the research endeavors to investigate the measures being taken in Montenegro to prevent fatalities arising from OC.

Methods

The data on OC death cases in Montenegro between 1990 and 2018 were collected using the International Classification of Diseases code 150 from the 9th edition and the code C15 from the 10th edition. Death certificates were the primary data source. The State Statistical Office provided data until 2009, which were unpublished until 1999 and published in the statistical yearbooks of the Institute for Public Health of Montenegro from 1999 to 2009. After 2009, the Institute for Public Health became the data source for causes of death.[24] Population data were obtained from the Statistical Office of Montenegro.[25]

The mortality rates were standardized according to the World Standard Population to estimate the overall and gender-specific trends of OC. The Joinpoint regression model was used to analyze the OC mortality rate and to identify significant changes in the linear time trend. The Estimated Annual Percentage Change (EAPC) and the Average Annual Percentage Change (AAPC) were used to describe the trend changes. The Joinpoint Software, version 5.0.2-May, 2023, from the Surveillance Research Program of the United States National Cancer Institute, was used for the analysis.[26] The regression line was adjusted to the natural logarithm of rates, using the calendar year as an independent variable, to determine the EAPC. The Grid-search method was chosen for the analysis, and the minimum number of observations for points from the end of the series to the first joinpoint was established as 3 and between two joinpoints as 4. The number of joinpoints was set between 0 and 5, and the permutation test facilitated the selection of the most fitting joinpoint model with an overall significance level of 0.05. Additionally, Linear and Poisson regressions were applied, and they were both executed in the Statistical Software for Social Sciences SPSS 26 (IBM Corp., Armonk, New York, USA). Ethical approval and consent were not required as this study was based on publicly available data.

Results

Between 1990 and 2018, there were 353 cases of death caused by OC. The average number of deaths per year was 12 for the overall level, 9.6 for men, and 2.6 for women (table 1). The average age-standardized rate was 1.34 deaths per 100 000 population with a significantly higher rate in men (2.32/100 000 in men, 0.51 deaths/100 000 in women) (table 1). Joinpoint regression analysis showed an increase in death rates for men and the overall level (table 1, figure 1), as well as for the age group 65–74 for the same categories which were not statistically significant. For other categories (women and other age groups), joinpoint regression could not be performed due to small values for rates (table 1). Mortality rates for men and overall remained stable throughout the observation period (figure 1).

However, a joinpoint regression for the number of cases reveals that the number of cases increases significantly with an average annual percentage increase of 2.6% for the overall level (AAPC (95% CI) =2.6 (1.0–4.2); $P = 0.002$) at the expense of the increase in men, which on average was 2.6% annually (AAPC (95% CI) =2.6 (1.2–4.1); $P = 0.001$) (table 1, figure 2).

To assess the significance of changes when dealing with a small number of cases, Poisson regression is a more sensitive method. The results obtained from this method indicate that there was a significant increase in the number of cases during the observed period, with statistical parameter for the overall level (β (95% CI) =0.028 (0.015–0.040); $P < 0.001$), and for male (β (95% CI) = 0.026 (0.012–0.041); $P < 0.001$) and female (β (95% CI) =0.033 (0.005–0.060); $P = 0.019$) (table 1).

The age groups 55–64 and 65–74 have the highest percentage of cases and deaths from OC, with 30.6% and 31.4%, respectively (figure 3). Joinpoint regression analysis has found a statistically significant increase in the number of death cases in males in these age groups, with an average annual increase of 2.2% and 3.1%, respectively. The largest increase in cases overall is seen in the age group of 75–84, with an average of 5% per year (AAPC (95% CI) = 5 (2.3–7.7); $P = 0.001$) (table 1). There was no single point in time where there was a statistically significant reversal in the movement of both mortality rates and the number of deaths from OC (figures 1 and 2).

Discussion

This study examines the mortality trend caused by OC in Montenegro between 1990 and 2018. On average, 12 individuals die each year in Montenegro from this type of cancer, with a higher number of deaths among males, accounting for 78.5% of cases. The rates have remained stable over the period, but there has been a statistically significant increase in the number of cases for men. The age-standardized rate for the observed period was roughly four times lower than the global average, at 1.34 deaths per 100 000 in the Montenegrin population. This places Montenegro among the countries with the lowest rates, such as the countries of Central America (ASR 0.92), West Africa (ASR 1.2), North Africa (ASR 1.5) and Western Asia (ASR 1.5).[5]

Globally, there has been a decrease in mortality rates from OC over recent decades,[4,5,27] except for the western sub-Saharan region of Africa, where the mortality rate has increased by about 30%. A global analysis of mortality rates over the past 30 years for the same type of cancer revealed no significant differences from 1990 to 1998, followed by a significant increase from 1998 to 2004, a rapid decline from 2004 to 2017, and a gradual increase from 2017 to 2019.[4]

OC is the primary cause of death from cancer in Bangladesh and Malawi. The frequency of OC varies greatly between the two most common histological subtypes. More than half of global OC deaths occur in East Asia, with an average death rate of 12.96 in 2019. Southern and Eastern Sub-Saharan Africa also have higher mortality rates with 11.30 and 10.77, respectively. Malawi has the highest death rate from OC at 25.76. China has the highest number of deaths from OC worldwide, with a reported 257 316 deaths and a mortality rate twice the global average (13.15) in 2019. Mortality rates vary based on the Human Development Index (HDI). Developed countries with lower HDI have higher mortality rates (8.19), while those with medium HDI have slightly lower rates (9.15). The highly developed countries have the lowest mortality rates (3.85).

For men, 21 regions recorded a decline in mortality, while 24 regions had stable trends. The USA, Chile, China, Korea, Colombia and France recorded the most significant decline in mortality rates. On the other hand, three regions had an increasing trend, including Thailand, Latvia and Portugal.[5]

For women, eight regions had a decline in mortality, while 36 regions had stable trends. China, Colombia, USA and Chile recorded the most significant reductions in mortality rates. Only one region, Austria, showed an increasing trend.[5]

During the observed period, Montenegro experienced an OC mortality rate ranging from 0.41 in 1990 to a maximum of 2.34 in 2014, with an average of 1.34 from 1990 to 2018. The last observed year showed a mortality rate of 0.90. In 2019, Nigeria, the Philippines, Peru and Greece recorded the lowest death rates at 1.0, 1.36, 1.38 and 1.39, respectively. Other countries like Egypt, Turkey, Italy and Mexico also had similar rates. For comparison, Serbia had a rate of 2.35[4] in the same year, with an average age-standardized rate of 1.8 from 1991 to 2015.[28]

The rate of men and women in Montenegro was 2.32/100 000 and 0.51/100 000, respectively, similar to the Belgrade population where

Table 1 Descriptive statistics for OC death cases and mortality rate in Montenegro and results of regression analyses for period 1990–2018

C15	Joinpoint regression for death cases	Joinpoint regression for mortality rate	Linear regression for mortality rate	Poisson regression for death cases	Death cases	Mortality rate	Overall death cases
	AAPC (95% CI)		β (95% CI)		Mean ± SD		
Men	2.6[a] (1.2–4.1)	0.9 (−0.2–2.5)	0.027 (−0.003–0.058)	0.026[a] (0.012–0.041)	9.60 ± 3.60	2.32 ± 0.71	277
25–34							2
35–44							6
45–54			0.743 (−1.043–2.530)	0.030 (−0.013–0.073)	1.69 ± 1.63	42.62 ± 39.05	49
55–64	2.2[a] (0.4–4.1)		1.468 (−0.430–3.368)	0.028[a] (0.003–0.053)	3.10 ± 1.47	96.86 ± 42.82	90
65–74	3.1[a] (1.2–5.0)	1.6 (−0.9–4.1)	2.291 (−0.462–5.046)	0.031[a] (0.005–0.057)	2.97 ± 1.43	143.48 ± 62.52	86
75–84			−0.295 (−5.872–5.282)	0.034 (−0.005–0.074)	1.24 ± 1.18	137.97 ± 120.29	36
85+							8
Women	1.9 (−1.2–5.0)		0.008 (−0.011–0.028)	0.033[a] (0.005–0.060)	2.60 ± 2.10	0.51 ± 0.44	76
25–34							0
35–44							3
45–54			0.192 (−0.621–1.007)	0.025 (−0.040–0.091)	0.45 ± 0.74	10.93 ± 17.64	13
55–64			0.143 (−1.036–1.324)	0.017 (−0.038–0.073)	0.62 ± 0.90	17.24 ± 25.48	18
65–74			0.636 (−1.074–2.348)	0.026 (−0.021–0.074)	0.86 ± 0.99	32.38 ± 37.30	25
75–84							14
85+							3
Total	2.6[a] (1.0–4.2)	1.1 (−0.5–3.2)	0.019 (−0.001–0.039)	0.028[a] (0.015–0.040)	12.20 ± 4.9	1.34 ± 0.48	353
25–34							2
35–44							9
45–54	3.0 (−0.6–6.7)		0.473 (−0.582–1.530)	0.029 (−0.010–0.070)	2.14 ± 1.96	26.62 ± 23.13	62
55–64	2.1 (−0.1–4.3)		0.839 (−0.365–2.045)	0.026[a] (0.003–0.049)	3.72 ± 1.96	55.17 ± 26.97	108
65–74	2.8[a] (1.0–4.6)	1.9 (−0.3–4.3)	1.462 (−0.059–2.865)	0.030[a] (0.007–0.052)	3.83 ± 1.73	81.17 ± 32.71	111
75–84	5.0[a] (2.3–7.7)		1.442 (−0.873–3.758)	0.050[a] (0.015–0.085)	1.72 ± 1.46	72.72 ± 51.43	50
85+							11

AAPC, Average annual percentage change; β, regression coefficient; CI, confidence interval.
a: indicated that AAPC and β are statistically significantly different from zero at a *P* values less than 0.05.

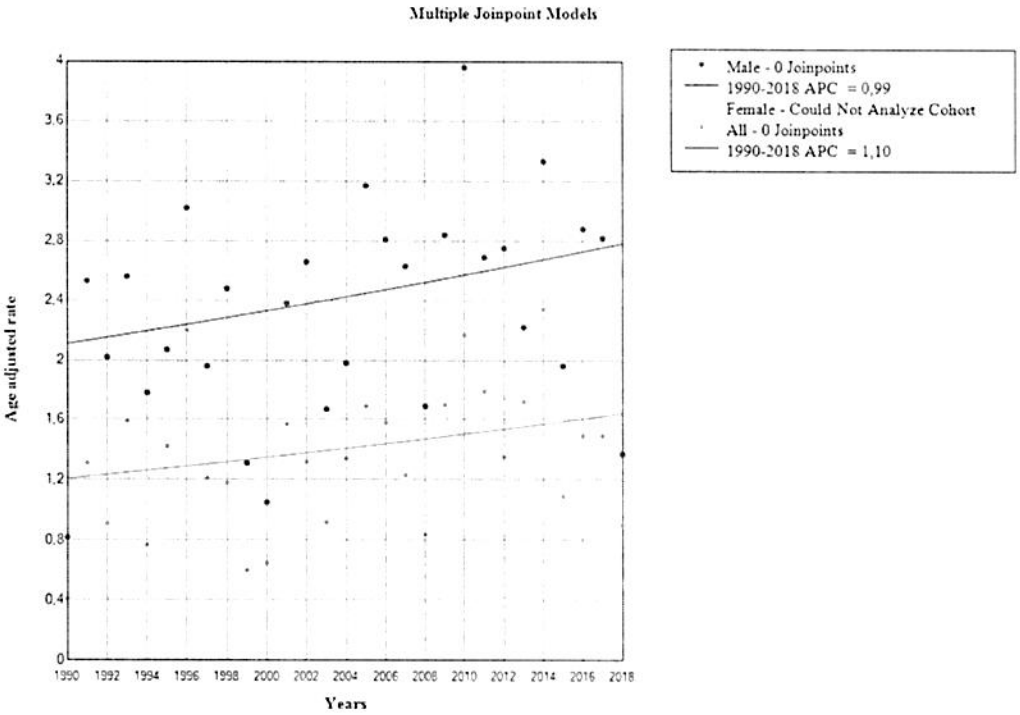

Figure 1 Joinpoint regression analysis of oesophageal cancer mortality (rates) in Montenegro from 1990 to 2018. AAR, age adjusted mortality rate; APC, annual percentage change.

they were 2.2 and 0.7. Men in Montenegro had a slightly lower mortality rate of 3.1 compared with the entire population of Serbia. The age groups most affected by death from OC were 55–64 with 30.6% of cases and 65–74 with 31.4% of cases, which is consistent with findings worldwide and also in Serbia. In Serbia, OC mortality rates increased with age, except for women aged 70–79 years. The mortality trend was significant only in men in the 50–59 age group (APC= +1.5%, 95%CI= 0.8–2.3).[28]

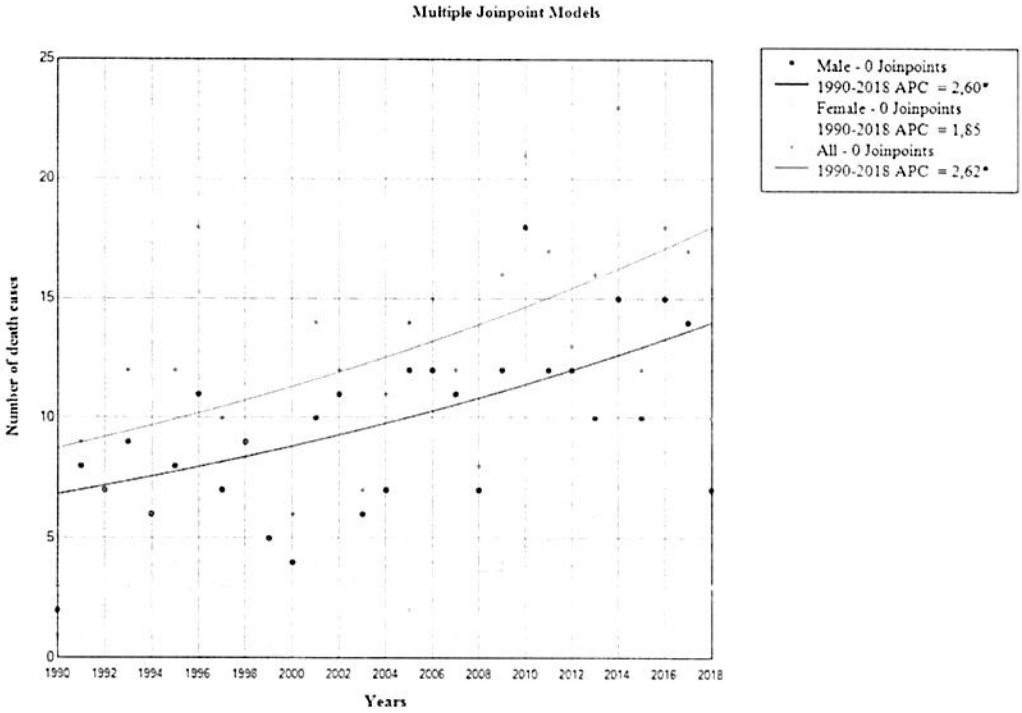

Figure 2 Joinpoint regression analysis of oesophageal cancer mortality (death cases) in Montenegro from 1990 to 2018. APC, annual percentage change; indicated that APC is significant different from zero at *P* values <0.05.

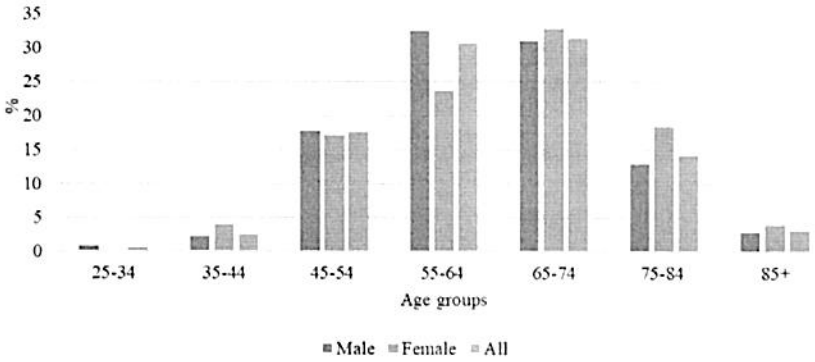

Figure 3 Distribution of oesophageal cancer mortality by age groups in Montenegro, 1990–2018.

In Montenegro, there has been a significant increase in the number of OC cases among males aged 50–64 and 65–74, with an average annual increase of 2.2% and 3.1%, respectively. Additionally, the largest increase in cases was observed in the age group of 75–84, with an average of 5% per year.[28]

In most countries/regions, there has been a decline in mortality from OC in recent years, especially among men and people over 50 years of age. However, in Montenegro, mortality is increasing for the overall population, men, and the elderly population, which is similar to the trend observed in Serbia.[28]

The male-to-female ratio of OC mortality rates in Montenegro is 4.5 on average, while the same ratio for Serbia is 5.2, with higher age-specific mortality rates observed in men in all age groups. Similarly, the rates of OC are generally higher in men than in women across the world.[5]

Neighboring countries like Croatia, Italy, Bulgaria and Slovenia have recorded a significant decrease in OC mortality rates among men, while the trend among women is stable.[5] In Serbia, the mortality trend for OC has significantly increased among men but not among women.[28]

The overall decrease in mortality is partly due to advancements in diagnostic technology and treatment, such as the detection and treatment of early stage malignant oesophageal tumours by upper endoscopy, neoadjuvant chemotherapy and minimally invasive oesophagectomy.[6]

There are several possible reasons for the reduction in OC mortality rate. These might include a decrease in major risk factors, socioeconomic development, and improved treatment methods. The global prevalence of tobacco and alcohol use has been decreasing since the 1980s, which is believed to have contributed to the overall decline in SCC since the 1990s.[29–31] It appears that the number of smokers in Montenegro has decreased based on available data.[31]

It is important to strengthen primary prevention measures against risk factors to prevent the development of cancer.[4] Many of these risk factors are modifiable, providing an opportunity for public

health interventions. Preventive measures and clinical treatment vary depending on the histological subtype. Obesity and metabolic syndrome are significant risk factors for EAC, and it is crucial to closely monitor and slow their rising rates. Monitoring the prevalence of obesity and metabolic syndrome is essential, as they pose significant risks for EAC. In Montenegro, there is a growing concern regarding the issue of obesity in children and adults in recent times. Therefore, the Ministry of Health of Montenegro developed a Program of measures to improve the nutritional status and nutrition in Montenegro with the Action Plan from 2021 to 2022, which was created as a continuation of the Program for the Prevention and Control of Chronic Non-Communicable Diseases 2019–2021.[32]

It is already stated that GERB can lead to BE and EAC. To control reflux, proton pump inhibitors (PPIs) are usually prescribed. PPIs have an acid-suppressive effect, as well as potential antioxidant and anti-inflammatory effects, which can help prevent cancer. In Montenegro, PPIs are used according to current recommendations.[19,20]

To diagnose dysplasia and monitor BE, we follow the ESGE guidelines from 2023.[19] If a patient is diagnosed with BE with low-grade dysplasia (LGD) on random 4-quadrant biopsies, we repeat the endoscopy. If there are no visible lesions and no advanced pathology [high-grade dysplasia (HGD) or EAC], we suggest follow-up for 6 months.

If LGD is found on repeated endoscopy after 6 months, we use endoscopic eradication therapy (EET). Dysplasia must be confirmed by another experienced pathologist. The risk of progression to HGD/EAC for patients with LGD is between 9.2% and 13.4% per patient per year.[33,34]

For patients with HGD without a visible lesion, we use ablative techniques to prevent progression to invasive cancer. Radiofrequency ablation (RFA) is the preferred ablative technique among patients undergoing EET. Alternative methods of EET include argon plasma coagulation (APC), hybrid APC and cryoablation. In Montenegro, we have the option of using APC.

EET has revolutionized the management of patients with BE-related neoplasia and offers an effective, minimally invasive treatment approach, avoiding the morbidity and mortality associated with oesophagectomy.[35] Contemporary practice includes endoscopic resection (ER) of any visible lesion within the BE segment, followed by ablative techniques such as RFA and cryotherapy to achieve complete eradication of dysplasia and reduce the risk of recurrent dysplasia/EAC. In Montenegro, we do not perform any of the mentioned ER techniques yet, but we hope to start soon to prevent unnecessary surgery in the majority of patients.[36]

High-risk patients require complete staging, which may involve endoscopic ultrasound in combination with computerized tomography (CT) or positron emission tomography, and consideration of additional treatments such as chemotherapy and/or radiotherapy and/or surgery.[19,36]

Montenegro does not conduct screening for BE or EAC, and it is not recommended according to the ESGE guidelines from 2023 due to the low risk in the general population.[19] The annual risk of progression to HGD or EAC in BE is 0.3–0.8%. Therefore, the cost-effectiveness of the BE screening program is questionable. However, screening can be considered in individuals aged 50 and over with chronic GERD symptoms and in those with at least one risk factor, such as white ethnicity, male gender, obesity, smoking or having a first-degree relative with BE or EAC.[23,37,38]

New screening modalities that do not require sedation may be more cost-effective than screening with standard sedated endoscopy.[19,20] With the implementation of such modalities, the indications for BE screening/case finding may be expanded in the future.[19]

For the diagnosis of BE in Montenegro, ESGE recommendations are followed. High-definition endoscopes with virtual chromoendoscopy are used before and in addition to Seattle protocol biopsy sampling.[36]

BE 'indeterminate' for dysplasia, of any length (confirmed by another pathologist), is advised to repeat oesophagogastroduodenoscopy within 6 months of increasing PPI dosing.[1]

Follow-up of a patient with BE is relative to BE length and dysplasia, as these are both accepted risk factors for disease progression.[19]

Currently, several multifactorial risk estimation tools are being studied to determine the optimal surveillance interval per individual patient, but such tools cannot yet be implemented.[19]

Conclusion

Monitoring the epidemiologic trend of OC is crucial because it can help formulate more effective public health and clinical strategies, as well as provide etiologic clues. Assessment of recent trends could benefit planning and resource allocation. As technology advances, it is expected that population-based targeted screening endoscopy with more advanced and less invasive technologies will be recommended for high-risk individuals. Montenegro has witnessed a recent increase in the number of deaths, although the mortality rates remain stable. This malignancy appears to impact predominantly two age groups, individuals aged 55–64 and 65–74, which highlights the need for specific attention to be given to this population during the ongoing monitoring of this cancer.

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Author contributions

Mirjana Nedović Vuković: conceptualization, data curation, formal analysis, investigation, methodology, validation, writing—original draft, and writing—review and editing; Marina Jakšić: writing—original draft, writing—review and editing; Brigita Smolović: writing—original draft, and writing—review and editing; Miloš Lukić: writing—review and editing; Zoran Bukumirić: formal analysis, methodology.

Data availability

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

Key points

- To our knowledge, this is the inaugural research conducted in Montenegro, which scrutinizes the mortality patterns related to oesophageal cancer (OC). Furthermore, this is the first attempt to investigate measures taken in Montenegro to prevent mortality from this type of cancer.
- Even though in most countries/regions there has been a decline in mortality from OC in recent years, the mortality rates in Montenegro have remained steady during the investigated period. Unfortunately, a rise in the number of deaths from OC was documented recently in Montenegro, and it seems that OC affects mostly people aged 55–64 and 65–74. Therefore, it is imperative to analyze the trends in mortality associated with OC to create effective prevention strategies.

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BIOGRAFIJA MIRJANA NEDOVIĆ VUKOVIĆ

Mirjana Nedović Vuković je rođena 10.04.1980.godine u Bijelom Polju, gdje je završila osnovnu školu kao đak generacije i gimnaziju kao Luča A. Nakon srednje škole upisuje Medicinski fakultet i stiče zvanje doktora medicine 2007. godine. Specijalizaciju iz medicinske statistike i informatike je završila na Medicinskom fakultetu u Beogradu 2014.godine, a 2016. početno istraživanje u okviru doktorskih studija na Medicinskom fakultetu u Podgorici na temu „Prednosti joinpont regresione analize u odnosu na jednostavnu linearnu regresiju na primjeru analize trenda mortaliteta od raka pluća u Crnoj Gori za period 1990-2009. "

Svoj radni angažman je započela 2008. godine u Domu zdravlja Podgorica kao ljekar pripravnik, a od 2010. godine je zaposlena u Institutu za javno zdrvalje Crne Gore gdje trenutno obavlja funkciju direktorke Centra za evidenciju podataka i istraživanja u oblasti javnog zdravlja, a od 2018. angažovana je i kao stručni saradnik na Medicinskom fakultetu u Podgorici, odsjek Visoka medicinska škola, na predmetu Metodologija istraživanja u zdravsrtvenoj njezi za osnovne studije i Osnovi metodologije istraživanja u zdravstvu sa informatikom za master studije.

Kontinuirano se bavi metodologijom naučnog istraživanja i kao specijalista medicinske statistike i informatike sprovela je statističke analize brojnih istraživanja (specijalističkih, magistarskih, doktorskih, naučnih) iz različitih oblasti medicine, a bila je saradnik i na nekoliko nacionalnih naučno-istraživačkih projekata. Kao značajno iskustvo izdvaja i učešće u međunarodnom projektu „Development and implementation of metacognitive problem-based modules in blended learning courses in medical sciences" (ProBLeMS). Istraživački interesi su joj uglavnom vezani za medicinke nauke, medicinskuu statistiku i informatiku i javno zdravlje.
Objavila je nekoliko autorskih i koautorskih radova indeksiranih u bazama SCI I SCIE liste.
Udata, majka Anđele, Nađe i Anje.

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23. A Djogo, S Medenica, T Vujovic, **MN Vukovic**. Influence of statin therapy on the production of steroids in hypertensive men in elder age. GIORNALE ITALIANO DI OSTRETRICIA E GINECOLOGIA. 2016. 38 (1), 78-78.
24. Bozidarka Rakocevic, Sanja Medenica, Olivera Bojovic, Boban Mugosa, **Mirjana Ne dovic-Vukovic**, Anita Grgurevic. Knowledge about tuberculosis among doctors in primaryhealthcareinstitutioninMontenegro.EuropeanRespiratoryJournal.2015 46: PA1 522; DOI: 10.1183/13993003.congress-2015.PA1522

UNIVERZITET CRNE GORE

MEDICINSKI FAKULTET

Na osnovu Odluke Senata Univerziteta Crne Gore br. 03-3985/2 od 24.12.2019. godine imenovani smo za mentora i komentora za izradu doktorske disertacije kandidata dr med. Mirjane Nedović Vuković. U fazi predaje doktorske disertacije na pregled i ocjenu, u skladu sa Pravilima doktorskih studija Univerzieta Crne Gore, dajemo:

SAGLASNOST

Saglasni smo da kandidat dr med. Mirjana Nedović Vuković može predati doktorsku disertaciju pod nazivom "**PRIMJENA REGRESIONIH MODELA U ANALIZI TRENDA UMIRANJA OD MALIGNIH NEOPLAZMI U CRNOJ GORI, 1990-2018.GODINE**" na pregled i ocjenu.

U Podgorici, 30.04. 2024. godine.

Mentor

Prof. dr Zoran Bukumirić

Komentor

Prof. dr Dragan Laušević

Univerzitet Crne Gore
adresa / address_ Cetinjska br. 2
81000 Podgorica, Crna Gora
telefon / phone _00382 20 414 255
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University of Montenegro

Broj / Ref 03 - 1424
Datum / Date 08. 05 20 18

Na osnovu člana 72 stav 2 Zakona o visokom obrazovanju („Službeni list Crne Gore" br. 44/14, 47/15,40/16,42/17,71/17) i člana 32 stav 1 tačka 9 Statuta Univerziteta Crne Gore, Senat Univerziteta Crne Gore na sjednici održanoj 08.05. 2018.godine, donio je

O D L U K U
O IZBORU U ZVANJE

Dr MILETA GOLUBOVIĆ bira se u akademsko zvanje redovni profesor Univerziteta Crne Gore za **oblast Patologija (Patološka anatomija, Opšta patologija, Oralna patologija) na Medicinskom fakultetu**, na neodređeno vrijeme.

UNIVERZITET CRNE GORE 1974

SENAT UNIVERZITETA CRNE GORE
PREDSJEDNIK
Prof.dr Danilo Nikolić, rektor

Biografija

Ime i prezime: Prof. dr Mileta Golubović

Redovni profesor, Medicinski fakultet Univerziteta Crne Gore

Rođen je 28. 07. 1973. godine u Beranama (Ivangrad), Crna Gora. Osnovnu školu i Gimnaziju završio sam u Beranama (Ivangrad). Na Medicinskom fakultetu Univerziteta u Prištini diplomirao je 11. januara 1999. godine. Tokom studiranja bavio se naučno-istraživačkim radom, tako da je bio autor i koautor više studentskih radova i učesnik Kongresa studenata medicine i stomatologije. Nakon završenog fakulteta, započeo je radni odnos u Domu zdravlja u Beranama, gdje je obavio i obavezan pripravnički staž. Tokom školske 1999/2000 godine, predavao je u Srednjoj medicinskoj školi u Beranama. Od 2000. godine zaposlen je kao u klinički ljekar u Centru za Patologiju i Sudsku medicinu Kliničkog Centra Crne Gore u Podgorici. Magistarsku tezu pod nazivom: "Imunohistohemijska analiza neuroendocrine diferencijacije karcinoma bronha u bronhobioptičkom materijalu i hirurškim resektatima pluća" odbranio je 4. septembra 2003. godine, na Medicinskom fakultetu Univerziteta u Kragujevcu. Specijalizaciju iz oblasti Patološka anatomija za potrebe Kliničkog Centra Crne Gore, završio je 24. juna 2005. godine, na Medicinskom fakultetu Univerziteta u Novom Sadu. Doktorsku disertaciju pod nazivom: „Imunohistohemijsko ispitivanje prognostičkih faktora u karcinoidu bronha" odbranio je 5. aprila 2007 godine, na Medicinskom fakultetu Univerziteta u Istočnom Sarajevu. Objavio je više naučnih radova u časopisima, koji se nalaze na referentnim bazama podataka. Održao je brojna uvodna predavanja, predavanja po pozivu i učesnik sam više Kongresa, Simpozijuma, Sekcija, Skupova i Work shop seminara iz oblasti Patologije u zemlji i instranstvu. Knjigu pod imenom: »Imunohistohemijske karakteristike neuroendokrine diferencijacijeu biopsijama karcinoma pluća« objavio je 2007. godine. Član je Advisory board-a u Croatian Medical Journal koji se nalazi na sljedećim bazama časopisa: Excerpta Medica, Current Contents/Clinical Medicine, Science Citation Index and Index Medicus/Medline. Prije izbora u Advisory board, bio je i regionalni editor u istom časopisu. Bio je član komisije za odbranu magistarskog rada i član komisija za odbranu doktorskih disertacija, predsjednik komisije za polazno istraživanje; kao i član više komisija za polaganje završnog ispita. Mentor je dodiplomskim, polaznim istraživanjima i doktorskoj disertaciji na Medicinskom fakultetu. Rukovodilac je više naučnoistraživačkih projekata čiji je nosilac Medicinski fakultet u Podgorici. Bio je član Savjeta za naučnoistaživačku djelatnost Vlade Crne Gore. Bio je predstavnik Crne Gore u Programskom odboru za Zdravlje, demografske promjene i dobrobit Horizonta 2020 Evropske Unije. Od 05. 03. 2015. je odlukom Komisije Ministarstva zdravlja u zvanju Primarijus. Za člana Radne grupe za izradu Strategije naučnoistraživačke djelatnosti (2017-2021) u Crnoj Gori izabran je 24. februara 2017. godine. Od 28. aprila 2016. godine je član Strukovnog vijeća za prirodne i tehničke nauke Senata Univerziteta Crne Gore. Član je Etičkog komiteta Medicinskog fakulteta Univerziteta Crne Gore u Podgorici od 20. februara 2017. godine.

Podaci o radnim mjestima i izborima u zvanja

Prvo zaposlenje Prof. dr Milete Golubovića, nakon završetka obaveznog ljekarskog staža, bilo je u Domu zdravlja u Beranama, 2000. godine. Nakon toga, nastavlja radni odnos kao klinički ljekar u Centru za Patologiju i Sudsku medicinu Kliničkog Centra Crne Gore u Podgorici (2000. godine). Angažovan je 2003. godine kao stručni saradnik na predmetu Patološka anatomija, na Medicinskom fakultetu Univerziteta Crne Gore u Podgorici, a od 2005. godine kao saradnik u nastavi na istom predmetu. Od 2005. godine, radi kao specijalista patolog u Centru za Patologiju i Sudsku medicine Kliničkog Centra Crne Gore u Podgorici. Godine 2007. godine izabran je u zvanje docenta na predmetu Patološka anatomija na Medicinskom fakultetu u Podgorici. Od iste godine je i predavač na predmetu Patologija i patofiziologija na Visokoj medicinskoj školi u Beranama Medicinskog fakulteta Univerziteta Crne Gore. Nakon formiranja studijskog programa Stomatologija na Medicinskom fakultetu u Podgorici predaje Opštu Patologiju i Oralnu Patologiju. Predavao je predmet Medicinska etika na Visokoj medicinskoj školi u Beranama Medicinskog fakulteta Univerziteta Crne Gore. Od 2010 do 2013. godine obavlja je dužnost prodekana za nauku na Medicinskom fakultetu u Podgorici. Godine 2012. godine izabran je u zvanje vanrednog profesora. Obavlja dužnost načelnika Odjeljenja patohistologije Centra za Patologiju KCCG. U zvanje redovni profesor izabran je 2018 godine. Takođe je odgovorni nosilac za grupu predmeta iz oblasti Patologija na Medicinskom fakultetu Univerziteta Crne Gore u Podgorici.

Izabrane publikacije

Godina	Kategorija	Autori	Naslov	Izvor
2018	SCI, SCIE, SSCI, A&HCI	Vuksanović-Božarić A, Abramović M, Vučković L, Golubović M, Vukčević B, Radunović M	Clinical significance of understanding lateral and medial circumflex femoral artery origin variability	Anatomical science international
2017	SCI, SCIE, SSCI, A&HCI	Golubović M, Lopičić M, Terzić N, Đurović M, Mugoša B, Mijović G	Presence of histopathological premalignant lesions and infection caused by high-risk genotypes of human papillomavirus in patients with suspicious cytological and colposcopy results: A prospective study	Vojnosanitetski pregled
2015	SCI, SCIE, SSCI, A&HCI	Vlahović, Z., Marković, A., Golubović Mileta, Šćepanović, M., Kalanović, M. & Djinić, A.	Histopathological comparative analysis of peri-implant soft tissue response after dental implant placement with flap and flapless surgical technique. Experimental study in pigs	Clinical Oral Implants Research
2015	SCI, SCIE, SSCI, A&HCI	Lazić, Z., Golubović Mileta, Marković, A., Šćepanović, M., Mišić, T. & Vlahović, Z.	Immunohistochemical analysis of blood vessels in peri-implant mucosa: a comparison between mini-incision flapless and flap surgeries in domestic pigs	Clinical Oral Implants Research
2015	SCI, SCIE, SSCI, A&HCI	Radojevic N, Cukic D, Curovic I, Golubovic M	Fatal laryngeal oedema in an adult from an air rifle injury, and related ballistics	Medicine, Science and the Law
2014	SCI, SCIE, SSCI, A&HCI	Gavrić, M., Antić, S., Jelovac,D.B., Zarev, A.I., Petrović, M. B., Golubović, M. & Antunović, M.	Osteonecrosis of the jaw as a serious adverse effect of bisphosphonate therapy and its indistinct etiopathogenesis	Vojnosanitetski pregled
2014	SCI, SCIE, SSCI, A&HCI	Smolović, B., Stanisavljević, D., Golubović, M., Vučković, Lj., Miličić, B. & Djuranović, S.	Bleeding Gastroduodenal Ulcers in Patients without Helicobacter Pylori Infection and without Exposure to Non-Steroidal Anti-Inflammatory Drugs	Vojnosanintetski pregled
2014	SCI, SCIE, SSCI, A&HCI	Mijović, G., Jovanović, T., Kuljić-Kapulica, N., Jokmanović, N., Bujko, M., Golubović, M.	Frequency and risk factors of cervical human papilloma virus infection in women in Montenegro	Archives of Biological Sciences
2013	SCI, SCIE, SSCI, A&HCI	Vlahović, Z., Mihailović, B., Lazić, Z. & Golubović, M.	Comparative Radiographic and Resonance Frequency Analyses of the Peri-Implant Tissue after Dental Implants Placement Using Flap and Flapless Techniques	Vojnosanitetski Pregled
2012	SCI, SCIE, SSCI, A&HCI	Andrić, B., Golubović, M., Terzić, D., Dupanović, B., Ičević, M.	First Diagnostic Cases of Human Babesiosis in Montenegro	The Brazilian Journal of Infectious Diseases
2012	SCI, SCIE, SSCI,	Golubović, M., Petrović, M., Jelovac,	Malignant Ameloblastoma Metastasis to the Neck--Radiological and	Vojnosanitetski pregled

Godina	Kategorija	Autori	Naslov	Izvor
	A&HCI	D. B., Nenezić, D.U., Antunović, M.	Pathohistological Dilemma	
2012	SCI, SCIE, SSCI, A&HCI	Mikić A, Zvrko E, Trivić A, Stefanović D, Golubović M.	Small Cell Neuroendocrine Tumor of the Larynx– A Small Case Series	Collegium Antropologicum
2011	SCI, SCIE, SSCI, A&HCI	Damjanov, I. & Golubović, M.	Histopathology of Urinary Bladder Carcinoma: Less Common Variants	Srpski arhiv za celokupno lekarstvo
2010	SCI, SCIE, SSCI, A&HCI	Golubović, M., Ašanin, B., Jelovac, D., Petrović, M., Antunović, M.	Povezanost histopatoloških karakteristika karcinoma usne sa progresijom bolesti	Vojnosanitetski pregled
2009	SCI, SCIE, SSCI, A&HCI	Zvrko E, Golubović M.	Laryngeal adenoid cystic carcinoma	Acta Otorhinolaryngol Ital

УНИВЕРЗИТЕТ У БЕОГРАДУ

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ВЕЋЕ НАУЧНИХ ОБЛАСТИ
МЕДИЦИНСКИХ НАУКА

Београд, 19. септембар 2023. године
02-01 Број: 61202-2860/2-23
ТК

На основу чл 75 Закона о високом образовању („Службени гласник РС", бр. 88/17, 73/18, 67/19, 11/21-аутентично тумачење и 67/21), члана 48 став 5 тачка 1 Статута Универзитета у Београду („Гласник Универзитета у Београду", бр. 201/18, 207/19, 213/20, 214/20, 217/20, 230/21, 232/22, 233/22, 236/22, 241/22, 243/22, 244/23, 245/23 и 247/23), члана 13 став 1 Правилника о већима научних области на Универзитету у Београду („Гласник Универзитета у Београду", бр. 134/07, 150/09, 158/11, 164/11, 165/11, 180/14, 195/16,197/17, 208/19, 215/20, 239/22 и 245/23), члана 23 став 1 тачка 1 Правилника о начину и поступку стицања звања и заснивања радног односа наставника Универзитета у Београду („Гласник Универзитета у Београду", бр. 237/22, 240/22 и 242/22) и Правилника о минималним условима за стицање звања наставника на Универзитету у Београду („Гласник Универзитета у Београду", бр. 192/16, 195/16, 197/17, 199/17, 203/18 и 223/21), а на предлог Изборног већа Медицинског факултета, број: 3719/2 од 5. јула 2023. године, Веће научних области медицинских наука, на седници одржаној 19. септембра 2023. године, донело је

О Д Л У К У

БИРА СЕ др Зоран Букумирић у звање ванредног професора на Универзитету у Београду-Медицински факултет за ужу научну област Статистика и информатика у медицини.

О б р а з л о ж е њ е

Медицински факултет („Факултет") је 26. априла 2023. године у листу „Послови", објавио конкурс за избор у звање ванредног професора за ужу научну област Статистика и информатика у медицини, због потреба Факултета.

Реферат Комисије за припрему Реферата о пријављеним кандидатима стављен је на увид јавности 5. јуна 2023. године преко сајта Факултета и на огласној табли Факултета.

На основу предлога Комисије за припрему Реферата о пријављеним кандидатима, Изборно веће Факултета, на седници одржаној 5. јула 2023. године, донело је одлуку о утврђивању предлога да се кандидат др Зоран Букумирић изабере у звање ванредног професора.

Факултет је 21. августа 2023. године доставио Универзитету комплетан захтев за избор у звање на прописаним обрасцима.

Универзитет је комплетну документацију коју је доставио Факултет ставио на web страницу Универзитета 12. септембра 2023. године.

Веће научних области медицинских наука, на седници одржаној 19. септембра 2023. године разматрало је захтев Факултета и утврдило да кандидат испуњава услове прописане чл. 74 и 75 Закона о високом образовању, чл. 135 Статута Универзитета у Београду, као и услове прописане Правилником о минималним условима за стицање звања наставника на Универзитету у Београду. па је донета одлука као у изреци.

Поука о правном средству:
Против ове одлуке кандидат пријављен на конкурс може изјавити жалбу Сенату Универзитета, преко Већа научних области медицинских наука. Жалба се доставља Већу научних области у року од 8 дана од дана достављања одлуке.

ПРЕДСЕДНИЦА ВЕЋА

проф. др Татјана Пекмезовић

Доставити:
- Факултету (2)
- архиви Универзитета

STRUČNA I NAUČNA BIOGRAFIJA

Ime i prezime: Zoran Bukumirić

Obrazovanje:

- Dodiplomske studije: Univerzitet u Prištini, Medicinski fakultet 1991-2000; Diploma doktora medicine. Prosečna ocena tokom studiranja 9,08.
- 12-mesečni staž: Klinički centar Kruševac 2001-2002; državnim ispitom u Beogradu potvrđena diploma doktora medicine.
- Poslediplomske studije: Univerzitet u Prištini, Medicinski fakultet, smer „Klinička farmakologija" 2001/02; Magistarska teza pod nazivom „Efekti esomeprazola i diazepama na razvoj stres ulkusa kod eksperimentalnih životinja" odbranjena je 31.03.2004. na Medicinskom fakultetu Priština, u Kosovskoj Mitrovici; Diploma magistra medicinskih nauka.
  Doktorska disertacija pod nazivom: „Sistematski pregled sa meta-analizom pouzdanosti i valjanosti psihijatrijskih skala u longitudinalnim studijama" iz uže naučne oblasti Medicinska statistika odbranjena je na Medicinskom Fakultetu Univerziteta u Beogradu 30.05.2016. godine.

Specijalizacija:

- Klinička farmakologija, završena 2009. godine na Zavodu za farmakologiju, toksikologiju i kliničku farmakologiju, Medicinskog fakulteta, Univerziteta u Novom Sadu.
- Medicinska statistika i informatika, završena 2017. godine na Institutu za medicinsku statistiku i informatiku, Medicinskog fakulteta Univerziteta u Beogradu.

Radno iskustvo:

- kao asistent pripravnik: Institut za farmakologiju i toksikologiju, Medicinski fakultet, Univerzitet u Prištini, od 15.02.2001-30.09.2005. godine;
- kao asistent sa magistarskim radom: Institut za farmakologiju i toksikologiju, Medicinski fakultet, Univerzitet u Prištini, od 01.10.2005-15.06.2008. godine.
- kao asistent sa magistarskim radom: Institut za medicinsku statistiku i informatiku, Medicinski fakultet, Univerzitet u Prištini, od 15.06.2008.-03.09.2012. godine.
- kao asistent sa magistarskim radom: Institut za medicinsku statistiku i informatiku, Medicinski fakultet Univerziteta u Beogradu, od 03.09.2012.- 27.03.2018 godine.
- kao docent: Institut za medicinsku statistiku i informatiku, Medicinski fakultet Univerziteta u Beogradu, od 28.03.2018.- 19.09.2023. godine.
- kao vanredni profesor: Institut za medicinsku statistiku i informatiku, Medicinski fakultet Univerziteta u Beogradu, od 20.09.2023. godine do danas.

Pedagoški rad:

Kao docent na Katedri za medicinsku statistiku i informatiku Medicinskog fakulteta, Univerziteta u Beogradu:

učešće u nastavnom radu od 28.03.2018. godine u okviru sledećih studijskih programa: integrisane akademske studije, osnovne akademske studije, master studije, specijalističke akademske studije, specijalističke strukovne studije i doktorske studije na Medicinskom fakultetu Univerziteta u Beogradu.

U okviru integrisanih akademskih studija medicine učestvuje u izvođenju svih oblika nastave na predmetima: Medicinska statistika i informatika – obavezni predmet na III godini studija (ukupan fond časova 50 tj. 3 ESPB), Primena informaciono-komunikacionih tehnologija – obaveze u nastavi na I godini studija (ukupan fond 30 časova tj. 2 ESPB) i Klinička informatika – izborni predmet na VI godini studija (ukupan fond 30 časova tj. 2 ESPB).

U okviru integrisanih akademskih studija medicine na engleskom jeziku učestvuje u izvođenju svih oblika nastave na predmetu ICT use in medicine – obaveze u nastavi na I godini studija (ukupan fond 30 časova tj. 2 ESPB).

U okviru osnovnih akademskih studija sestrinstva učestvuje u izvođenju svih oblika nastave na predmetima: Informacione tehnologije u zdravstvenoj zaštiti – obavezni predmet na I godini studija (ukupan fond časova 30 tj. 3 ESPB) i Zdravstvena statistika – obavezni predmet na II godini studija (ukupan fond časova 45 tj. 3 ESPB).

Dr. Zoran Bukumirić učestvuje u izvođenju svih oblika nastave na master studijama u Centru – Škola javnog zdravlja pri Medicinskom fakultetu Univerziteta u Beogradu i to u okviru obaveznog predmeta – Biostatistika u javnom zdravlju (ukupan fond 64 časova tj. 7 ESPB) i izbornog predmeta – Javnozdravstvena informatika (ukupan fond 50 časova tj. 5 ESPB), kao i u okviru obaveznog predmeta Biostatistika u oblasti prevencije i terapije vežbanjem (ukupan fond 50 časova tj. 5 ESPB) na master studijama Fizička aktivnost, zdravlje i terapija vežbanjem.

U okviru specijalističkih akademskih studija učestvuje u izvođenju svih oblika nastave na predmetima Statistika za istraživače u oblasti medicinskih nauka (ukupan fond časova 75 tj. 7 ESPB) i Informatika za istraživače u oblasti medicinskih nauka (ukupan fond časova 30 tj. 3 ESPB). Takođe učestvuje u nastavi na doktorskim studijama u izvođenju svih oblika nastave na predmetima Biostatistika I, bazični kurs (ukupan fond časova 75 tj. 7 ESPB), Biostatistika II, napredni kurs (45 časova tj. 5 ESPB) i Informatika za istraživače u oblasti medicinskih nauka (ukupan fond časova 30 tj. 3 ESPB). U okviru specijalističkih strukovnih studija učestvuje u izvođenju svih oblika nastave na predmetu Osnove biostatistike i informatike (ukupan fond časova 58).

Doc dr. Zoran Bukumirić učestvuje i u izvođenju nastave u okviru specijalističkih i subspecijalističkih programa na Medicinskom fakultetu Univerziteta u Beogradu. U okviru nastave iz uže specijalizacije na Katedri opštih metodoloških predmeta aktivni je učesnik u izvođenju predmeta Zdravstvena statistika (ukupan fond 30 časova) i Zdravstvena informatika (30 časova). Dr. Bukumirić učestvuje i u izvođenju nastave iz predmeta Medicinska statistika koji se održava u okviru specijalizacije iz preventivnih i dijagnostičkih grana (socijalna medicina, epidemiologija, klinička biohemija, higijena, medicina rada, medicinska statistika i informatika - 20 časova). Takođe, učestvuje i u delu nastave koja se odnosi na primenu informatike u medicini na Katedri za opštu medicinu, kao i oblasti primene statistike i informatike u medicini na Katedri za transfuziologiju.

Takođe, dr. Bukumirić je angažovan i u svim oblicima poslediplomske nastave iz uže naučne oblasti Statistika i informatika u medicini, i to u okviru: specijalizacije iz Medicinske statistike i informatike, kao i uže specijalizacije iz Medicinske informatike i specijalističkih akademskih studija Medicinska statistika i informatika i doktorskih studija Biomedicinska informatika.

Doc dr. Zoran Bukumirić je 17.02.2021. godine imenovan za rukovodioca nastave za predmet Informacione tehnologije u zdravstvenoj zaštiti, na studijskom programu osnovnih akademskih studija – sestrinstvo Medicinskog fakulteta Univerziteta u Beogradu.

Angažovanju u razvoju nastave i drugih delatnosti visokoškolske ustanove

- Na Medicinskom fakultetu Univerziteta u Beogradu iz oblasti Statistika i informatika u medicini dr Bukumirić je uzeo učešće u razvoju i implementaciji:
  1. Elektronske nastave na Integrisanim akademskim studijama iz predmeta: Primena informaciono-komunikacionih tehnologija u medicini i ICT use in medicine (I godina opšte medicine), Medicinska statistika i informatika (III godina opšte medicine) i Klinička informatika – izborni predmet (VI godina opšte medicine); praktična nastava na Specijalističkim akademskim studijama i Doktorskim studijama iz predmeta: Statistika za istraživače u oblasti medicinskih nauka / Biostatistika I (I godina) i Informatika za istraživače u oblasti medicinskih nauka (I godina); praktična nastava na II godini Doktorskih studija iz predmeta: Biostatistika II; praktična nastava za Uže specijalizacije i deo Opštih specijalizacija

iz predmeta: Zdravstvena statistika i Zdravstvena informatika; praktična nastava na Osnovnim akademskim studijama sestrinstva iz predmeta: Informacione tehnologije u zdravstvenoj zaštiti (I godina) i Zdravstvena statistika u sestrinstvu (III godina); praktična nastava na Specijalističkim strukovnim studijama sestrinstva iz predmeta: Osnove biostatistike i informatike; praktična nastava na Master studijama iz predmeta: Biostatistika u javnom zdravlju i Biostatistika u oblasti prevencije i terapije vežbanjem..

U periodu 29.09.2014.-01.10.2020. godine od strane Katedre za medicinsku statistiku i informatiku bio je imenovan za Koordinatora elektronske nastave.

2. Sistema za elektronsko praćenje uspeha studenata (e-studentski karton)
3. Onlajn programa kontinuirane medicinske edukacije.

- Zoran Bukumirić i Goran Trajković autori su novog tehničkog rešenja u fazi realizacije (M85) u oblasti elektronskog učenja pod nazivom: „Problemski baziran model za sticanje i procenu znanja iz statistike i informatike u medicini, statističku analizu podataka i interpretaciju rezultata" (2020), koje je verifikovano od strane matičnog odbora Ministarstva Prosvete i nauke Republike Srbije.
- Doc. dr Zoran Bukumirić je 05.01.2022. godine imenovan za predsednika Stručne komisije za rad na elektronskoj obradi podataka i testova na Medicinskom fakultetu Univerziteta u Beogradu, na mandat od 3 školske godine.
- Doc. dr Zoran Bukumirić je 10.05.2022. godine imenovan za člana Etičke komisije za zaštitu dobrobiti oglednih životinja na Medicinskom fakultetu Univerziteta u Beogradu, na mandat od 3 godine.
- Dr Zoran Bukumirić je angažovana putem konsultacija u pripremi, kao i obradi podataka vezanih za specijalističke akademske radove, specijalističke i subspecijalističke radove, izradi predloga projekata medicinskih istraživanja, kao i pripremi naučnih radova za publikovanje u naučnim i stručnim časopisima.
- Dr Zoran Bukumirić je bio mentor više studentskih radova koji su prezentovani na kongresima studenata medicine. Aktivno učestvuje i kao recenzent studentskih radova.
- Stručni doprinos dr Zorana Bukumirić je u oblasti kliničkih i javnozdravstvenih istraživanja, njihovom dizajnu i statističkoj analizi. Savremeno proučavanje zdravlja populacije zahteva primenu informaciono komunikacionih tehnologija u čijem je uspostavljanju i edukaciji korisnika za korišćenje istih kandidat takođe dao značajan doprinos.

Strani jezici: čita, piše i govori engleski; služi se ruskim jezikom

Članstva u profesionalnim društvima:

- EACPT (evropska asocijacija za kliničku farmakologiju i terapiju)
- Srpsko farmakološko društvo
- Srpsko lekarsko društvo, Sekcija kliničke farmakologije

Profesionalne posete/usavršavanje/kontinuirana medicinska edukacija:

- 4rd European Summer School in Clinical Pharmacology and Therapeutics, September 16-20, 2006, Vrsac, Serbia.
- Introduction to clinical research and principles of good clinical practice, 20-21 june 2008. Banja Luka, Republic of Srpska.
- Obuka za korišćenje eLearning sistema na MOODLE platformi. 2010, Beograd, Srbija.

Saradnja sa drugim visokoškolskim ustanovama, naučnoistraživačkim ustanovama

1. Učešće u formiranju Centra za biostatistiku i informacione tehnologije (CEBSIT) Medicinskog fakulteta u Prištini sa sedištem u Kosovskoj Mitrovici, a 23.12.2010. godine imenovan je za upravnika CEBSIT-a i tu funkciju obavljao je do 31.09.2012. godine.
   Od 2012. godine sa CEBSIT-om sarađuje i kao koordinator elektronske nastave.
2. Saradnja u oblasti nastavne delatnosti ogleda se u zajedničkom radu na kreiranju i razvoju:
   - kurseva elektronske nastave na Integrisanim akademskim i Doktorskim studijama Medicinskog fakulteta u Prištini sa privremenim sedištem u Kosovskoj Mitrovici.
   - MOODLE platforme za elektronsko učenje implementirane u okviru portala CEBSIT-a.
   - sistema za e-testiranje koji omogućava polaganje ispita iz oblasti Medicinske statistike i informatike preko računara.

c) Citiranost

Uvidom u Konzorcijum biblioteka Srbije za objedinjenu nabavku (KoBSON), koristeći SCOPUS bazu apstrakata i citata iz naučnih i akademskih časopisa ustanovljeno je 1274 citata publikacija dr Bukumirića, h-index iznosi 17.

d) Organizovanje naučnih sastanaka i simpozijuma

Član organizacionog odbora 12 Kongresa farmakologa Srbije i 2. Kongresa kliničke farmakologije Srbije sa međunarodnim učešćem. Palić, 9-12. maj 2007.godine.

e) Druga dostignuća (recenzije, recenzije u časopisima)

- Recenzent časopisa „Engrami".
- Recenzent studentskih radova u oblasti Medicinske statistike i informatike na Medicinskom fakultetu Univerziteta u Beogradu.

1. SPISAK RADOVA-Zoran Bukumirić

1. Originalni radovi in extenso u časopisima sa JCR liste

1. Nedovic Vukovic M, Jaksic M, Smolovic B, Lukic M, **Bukumiric Z**. Trends in esophageal cancer mortality in Montenegro, 1990 – 2018. European Journal of Public Health. 2024-prihvaćen za publikaciju.
2. Nedovic Vukovic M, Terzic Z, Golubovic M, Bojic M, **Bukumiric Z**. Skin Melanoma Mortality Trend in Montenegro for the period of 1990-2018. Eur Rev Med Pharmacol Sci. 2024-prihvaćen za publikaciju
3. Nedović Vukovic M, Jakšić M, Smolović B, Lukić M, **Bukumirić Z**. Trends in gastric cancer mortality in Montenegro, 1990 - 2018: joinpoint regression. Oncology. 2024 Feb 19. doi: 10.1159/000537739.
4. Tomic T, Henman M, Tadic I, Antic Stankovic J, Santric Milicevic M, **Bukumiric Z**, Lakic D, Odalovic M. Immediate and long-term effects of COVID-19 on antibiotic dispensing: increasing use of Watch antibiotics. J Infect Dev Ctries. 2024 Apr 30;18(4):504-512. doi: 10.3855/jidc.19255.
5. Rajsic S, Breitkopf R, Treml B, Jadzic D, Innerhofer N, Eckhardt C, Oberleitner C, **Bukumiric Z**. Association of anti-factor Xa-guided anticoagulation with hemorrhage during ECMO support: A systematic review and meta-analysis. Clin Cardiol. 2024 May;47(5):e24273. doi: 10.1002/clc.24273.
6. Jovanović D, Backović D, Tomas A, **Bukumirić Z**, Koprivica B. Predisposition and Working Conditions for the Occurrence of Lumbar Syndrome in Medical Workers of the Clinical Center of Montenegro during the COVID-19 Pandemic. J Clin Med. 2024 Apr 21;13(8):2431. doi: 10.3390/jcm13082431.
7. Mitrovic M, Pantic N, **Bukumiric Z**, Sabljic N, Virijevic M, Pravdic Z, Cvetkovic M, Ilic N, Rajic J, Todorovic-Balint M, Vidovic A, Suvajdzic-Vukovic N, Thachil J, Antic D. Venous thromboembolism in patients with acute myeloid leukemia: development of a predictive model. Thromb J. 2024 Apr 17;22(1):37. doi: 10.1186/s12959-024-00607-6.
8. Santric-Milicevic M, Pavlekic K, **Bukumiric Z**, Stevanovic A, Nikolic D, Matejic B, Matanovic D, Backovic D, Tulic G, Lukic R, Zivanovic D, Radosavljevic S, Milovanovic V, Zdujic M, Stankovic S, Asanin M, Zdravkovic M, Tomasevic R. Nurses' Perception of Tension, Stress, and Pressure before and during the COVID-19 Pandemic: A Multicenter Serbian Study. Healthcare (Basel). 2024 Mar 15;12(6):663. doi: 10.3390/healthcare12060663.
9. Gudović A, **Bukumirić Z**, Milincic M, Pupovac M, Andjić M, Ivanovic K, Spremović-Radenović S. The Comparative Effects of Myo-Inositol and Metformin Therapy on the Clinical and Biochemical Parameters of Women of Normal Weight Suffering from Polycystic Ovary Syndrome. Biomedicines. 2024 Feb 2;12(2):349. doi: 10.3390/biomedicines12020349.
10. Nedović Vuković M, Jakšić M, Smolović B, Lukić M, **Bukumirić Z**. Trends in gastric cancer mortality in Montenegro, 1990 - 2018: joinpoint regression. Oncology. 2024 Feb 19. doi: 10.1159/000537739.
11. Jelicic J, Larsen TS, Andjelic B, Juul-Jensen K, **Bukumiric Z**. Should we use nomograms for risk predictions in diffuse large B cell lymphoma patients? A systematic review. Crit Rev Oncol Hematol. 2024 Apr;196:104293. doi: 10.1016/j.critrevonc.2024.104293.
12. Markovic M, Ranin J, **Bukumiric Z**, Jerotic D, Savic-Radojevic A, Pljesa-Ercegovac M, Djukic T, Ercegovac M, Asanin M, Milosevic I, Stevanovic G, Simic T, Coric V, Matic M. GPX3 Variant Genotype Affects the Risk of Developing Severe Forms of COVID-19. Int J Mol Sci. 2023 Nov 10;24(22):16151. doi:10.3390/ijms242216151.
13. Belamarić G, **Bukumirić Z**, Vuković M, Spaho RS, Marković M, Marković G, Vuković D. Knowledge, attitudes, and practices regarding antibiotic use among the population of the

Republic of Serbia - A cross-sectional study. J Infect Public Health. 2023 Dec;16 Suppl 1:111-118. doi: 10.1016/j.jiph.2023.11.009.

14. Jelicic J, Juul-Jensen K, **Bukumiric Z**, Roost Clausen M, Ludvigsen Al-Mashhadi A, Pedersen RS, Poulsen CB, Brown P, El-Galaly TC, Stauffer Larsen T. Prognostic indices in diffuse large B-cell lymphoma: a population-based comparison and validation study of multiple models. Blood Cancer J. 2023 Oct 13;13(1):157. doi: 10.1038/s41408-023-00930-7.
15. Rajsic S, Breitkopf R, Kojic D, **Bukumiric Z**, Treml B. Extracorporeal Life Support for Patients With Newly Diagnosed HIV and Acute Respiratory Distress Syndrome: A Systematic Review and Analysis of Individual Patient Data. ASAIO J. 2023 Dec 1;69(12):e513-e519. doi: 10.1097/MAT.0000000000002047.
16. Breitkopf R, Treml B, **Bukumiric Z**, Innerhofer N, Fodor M, Radovanovic Spurnic A, Rajsic S. Cytomegalovirus Disease as a Risk Factor for Invasive Fungal Infections in Liver Transplant Recipients under Targeted Antiviral and Antimycotic Prophylaxis. J Clin Med. 2023 Aug 9;12(16):5198. doi:10.3390/jcm12165198.
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24. Mitrovic M, Pantic N, Sabljic N, **Bukumiric Z**, Virijevic M, Pravdic Z, Cvetkovic M, Rajic J, Bodrozic J, Milosevic V, Todorovic-Balint M, Vidovic A, Suvajdzic-Vukovic N, Antic D. Arterial Thrombosis in Patients with Acute Myeloid Leukemia: Incidence and Risk Factors. Cancers (Basel). 2023 Jun 5;15(11):3060. doi: 10.3390/cancers15113060.
25. Rajsic S, Treml B, Jadzic D, Breitkopf R, Oberleitner C, Bachler M, Bösch J, **Bukumiric Z**. aPTT-guided anticoagulation monitoring during ECMO support: A systematic review and meta-analysis. J Crit Care. 2023 Oct;77:154332. doi: 10.1016/j.jcrc.2023.154332.
26. Rajsic S, Breitkopf R, Treml B, Jadzic D, Oberleitner C, Oezpeker UC, Innerhofer N, **Bukumiric Z**. Association of aPTT-Guided Anticoagulation Monitoring with Thromboembolic Events in Patients Receiving V-A ECMO Support: A Systematic Review and Meta-Analysis. J. Clin. Med. 2023, 12, 3224. (M22, IF 4.964)

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28. Breitkopf R, Treml B, Senoner T, **Bukumirić Z**, Rajsic S. Invasive Fungal Breakthrough Infections under Targeted Echinocandin Prophylaxis in High-Risk Liver Transplant Recipients. J Fungi (Basel). 2023 Feb 18;9(2):272. (M21, IF 5.724)
29. Breitkopf R, Treml B, Simmet K, **Bukumirić Z**, Fodor M, Senoner T, Rajsic S. Incidence of Invasive Fungal Infections in Liver Transplant Recipients under Targeted Echinocandin Prophylaxis. J Clin Med. 2023 Feb 14;12(4):1520. (M22, IF 4.964)
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33. Rajsic S, Treml B, Jadzic D, Breitkopf R, Oberleitner C, Popovic Krneta M, **Bukumiric Z.** Extracorporeal membrane oxygenation for cardiogenic shock: a meta-analysis of mortality and complications. Ann Intensive Care. 2022 Oct 5;12(1):93. (M21, IF 10.318)
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34. Ćorac A., Ilić D., Jović J., **Bukumirić Z**. Upotreba novih vrsta dizel goriva i zagađenje vazduha sumpor dioksidom. Prvi međunarodni kongres higijene i preventivne medicine. 22-24. maj 2013. Beograd, Srbija.
35. Ilić D, Ćorac A, Jović J, Mirković M, Đurić S, **Bukumirić Z**. Koncentracija čađi na geografski bliskim područjima sa različitim komunalnim karakteristikama. Prvi međunarodni kongres higijene i preventivne medicine. 22-24. maj 2013. Beograd, Srbija.
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41. **Bukumirić Z**, Janjić V, Ćorac A, Anđelković D, Kostić M, Ilić S. Analiza faktora rizika za pojavu simptoma nesanice kod studenata medicine. 46. Dani preventivne medicine. Međunarodni kongres. 25.-28.09.2012, Niš.
42. Momčilo Mirković, Đurić S, **Bukumirić Z**, Ćorac A, Radojković Ž , Mehović M. Učestalost i prediktori navike pušenja cigareta među studentima medicine u Kosovskoj Mitrovici. 46. Dani

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available hypericum perforatum products in Serbia, in forced swimming and tail suspension tests in mice. Int J Neuropsychop. 2008;11(Suppl 1):210.
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9. Izvod sa nacionalnog skupa:

1. Terzić B, Živković M, Ljutić S, Jovanović V, Jovičić J, Aćimović M, Bumbaširević U, Durutovic O, **Bukumirić Z**, Lađević N. P37 Primena traneksamične kiseline u cilju smanjenja perioperativnog gubitka krvi kod pacijenata sa benignom hiperplazijom prostate podvrgnutim operativnom lečenju transvezikalnom prostatektomijom. XXV KONGRES UROLOGA SRBIJE. 17-18. septembar 2021. godine. Beograd, Srbija.
2. **Bukumiric Z**, Trajkovic G. Evaluacija informacija o zdravlju dostupnih na internetu. PLENUM. Saradnja kao izbor, Nacionalni kongres zdravstvenih radnika Srbije sa međunarodnim učešćem. 23.10.-27.10.2019. Zlatibor.
3. **Bukumiric Z**. Meta-analiza u psihijatriji. Drugi Nacionalni kongres bolničke psihijatrije sa međunarodnim učešćem, Beograd, 10-12. oktobar 2018. godine.
4. Trajković G., **Bukumirić Z**. Izbor adekvatnog statističkog testa. V Nedelja bolničke kliničke farmakologije. 29. novembar – 1. decembar 2013. Beograd, Srbija.
5. **Bukumirić Z**, Janjić V, Ćorac A, Stanojević Z, Vukmirović S, Stolić A, Bogojević D. Farmakološka aktivnost preparata kantariona domaće proizvodnje. Engrami 2008;30(Suppl 1):72.
6. Janjić V, Đukić Dejanović S, Milovanović D, Janković S, Jovanović M, Ravanić D, **Bukumirić Z**. Farmakoekonomija nesanice. Engrami. 2008;30(Suppl 1):37-38.
7. Stanojević Z., Mitić R., **Bukumirić Z**., Bisevac B., Stević S.: Correlations hematological variables of aspirin and ticlopidine administered alone and in combination in rat. XII Serbian Congress of Pharmacology and II Serbian Congress of Clinical Pharmacology, Palic, Serbia, 2007. Abstract book:43.
8. **Bukumirić Z**., Janićijević-Hudomal S., Janjić V., Rašić J., Piperski V., Stanojević Z.: The effect of diazepam on development of stress ulcer lessions in experimental animal. XII Serbian Congress of Pharmacology and II Serbian Congress of Clinical Pharmacology, Palic, Serbia, 2007. Abstract book:31.
9. **Bukumirić Z**, Janjić V. Antidepresivi u tretmanu pacijenata lečenih u psihijatrijskoj dnevnoj bolnici. XII Kongres psihijatara Srbije i Crne Gore. Herceg Novi, Srbija i Crna Gora, 2004. Zbornik sažetaka:21-2.

10. Udžbenici, praktikumi:

1. Trajković G i **Bukumirić Z**: Medicinska statistika u *R* programskom okruženju. Medicinski fakultet Univerziteta u Beogradu, 2019.
2. Milić N, Stanisavljević D, Trajković G, Miličić B, **Bukumirić Z**, Gajić M, Mašić S.: Biomedicinska informatika. Medicinski fakultet Foča, 2017.
3. Stanojević Z., **Bukumirić Z**., Bulajić S.: Farmakografija. Medicinski fakultet Priština, Kosovska Mitrovica, 2007.
4. Stanulović M. (glavni urednik). Lekovi u prometu. Priručnik o lekovima i njihovoj primeni ATC klasifikacija. Ortomediks, Novi Sad - Beograd - Kosovska Mitrovica - Podgorica, 2006.
5. Janićijević-Hudomal S., Stevović-Rašić J., Mitić R., Stanojević Z., **Bukumirić Z**.: Priručnik iz farmakologije sa toksikologijom za studente stomatologije, Medicinski fakultet Priština, Kosovska Mitrovica, 2004.

12. Monografije, poglavlja:

1. Prof. dr Milan Barać, Prof. dr Slaviša Stanišić, Prof. dr Milan Parlić, **Ass. dr Zoran Bukumirić**, Ass. Nikica Vitas, dr Predrag Manojlović: Lokalni ekološki akcioni plan Severne Kosovske Mitrovice. Kosovska Mitrovica, 2010.

2. SPISAK UČEŠĆA U STRUČNIM ILI NAUČNIM ISTRAŽIVAČKIM PROJEKTIMA

1. Od 2011. godine angažovan kao istraživač na projektu INDUSTRIJA OLOVA I CINKA, POSLEDICE PO STANOVNIŠTVO I UREĐENJE I ZAŠTITA EKOSISTEMA rukovodioca Prof. dr Aleksandra Ćorca, odobrenog i finansiranog od strane Ministarstva za nauku i tehnološki razvoj Republike Srbije. Broj projekta TR37016.
2. Od 2021. godine angažovan kao istraživač na projektu THE ROLE OF ANTIOXIDANT AND ACE2 GENETIC PROFILE IN RISK STRATIFICATION AND MID-TERM PROGNOSIS OF COVID-19 PATIENS rukovodioca Prof. dr Tatjane Simić, odobrenog za finansiranje u okviru Specijalnog programa istraživanja COVID–19 Fonda za nauku Republike Srbije. Šifra projekta 7546803.
3. PRICOV-19 STUDY: A cross-sectional study in 38 countries on the organization of care in general practices during the COVID-19 pandemic. PRICOV-19 was initiated in the summer of 2020. Under the coordination of 'Quality and Safety Ghent,' an interdisciplinary center of expertise for quality and safety in primary care and transdisciplinary care within the Department of Public Health and Primary Care at Ghent University (Belgium).
4. ERAZMUS+ projekat: Development and Implementation of Metacognitive Problem-based Modules in Blended Learning Courses in Medical Sciences (ProBLeMS), broj projekta 101082790, period trajanja 01.04.2023-30.03.2026. godine.

3. SPISAK MENTORSTAVA

diplomski radovi:

1. Kandidat Aleksandar Rašić, „Meta-analiza u *R* programskom okruženju", odbranjen na Medicinskom fakultetu Univerziteta u Beogradu 15.07.2021. godine.
2. Dženan Mavrić. „Ocene dijagnostičkih performansi u *R* programskom okruženju", odbranjen na Medicinskom fakultetu Univerziteta u Beogradu 15.07.2021. godine.

4. SPISAK UČEŠĆA U KOMISIJAMA ZA ODBRANU RADOVA

odbrana doktorske disertacije

1. Kandidat Katica Tripković, „Ispitivanje faktora povezanih sa namerom javnozdravstvenih radnika u Republici Srbiji da promene posao" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor Prof. dr Milena Šantrić Milićević, 2023. godine.
2. Kandidat Marko Savić, „Grafički prikaz podataka u biomedicinskim istraživanjima: sistematski pregled literature i razvoj interaktivnog softverskog rešenja" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor Prof. dr Nataša Milić, 2022. godine.
3. Kandidat Nemanja Isajev, „Ispitivanje kliničke inertnosti u terapiji dijabetes melitusa tip 2 među lekarima primarne zdravstvene zaštite u Beogradu" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentori Prof. dr Vesna Bjegović i Akademik prof dr Nebojša Lalić, 2022. godine.
4. Kandidat Smiljana Cvjetković, „Istraživanje prediktora psihološkog distresa i spremnosti na traženje profesionalne psihološke pomoći kod studenata beogradskog univerziteta" odbranjena na Medicinskom fakultetu Univerziteta u Beogradu, mentori Prof. dr Vesna Bjegović Mikanović, Medicinski fakultet Univerziteta u Beogradu i komentor Prof. dr Viviana Langher, Faculty of Medicine and Psychology, Sapienza University of Rome, 2021. godine.

5. Kandidat Srđan Mašić, „Uticaj stavova studenata medicine prema statistici na sticanje kompetencija iz oblasti biostatistike: multicentrična studija i meta-analiza" odbranjena na Medicinskom fakultetu Univerziteta u Beogradu, mentor Prof. dr Nataša Milić, 2019. godine.

6. Kandidat Aleksandra Ilić, „Evaluacija metoda za ocenu povezanosti faktora rizika i ishoda iz studija kohorti i anamnestičkih studija: sistematski pregled sa meta-analizom" odbranjena na Medicinskom fakultetu Univerziteta u Prištini sa sedištem u Kosovskoj Mitrovici, mentor Prof. dr Goran Trajković, 2018. godine.

odbrana master akademskog rada

1. Kandidat Bojana Pavlović, „Znanje, stavovi i ponašanje studenata medicine u vezi sa seksualnim i reproduktivnim zdravljem" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor doc dr. Danijela Tiosavljević, 2022. godine

odbrana rada uže specijalizacije

1. Kandidat Dejan Dimitrijević, „Analiza karakteristika nedobrovoljnih hospitalizacija u Specijalnoj bolnici za psihijatrijske bolesti „dr Slavoljub Bakalović" u Vršcu" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor prof. dr Srđan Milovanović, 2023. godine.

2. Kandidat Dejana Stanisavljević, „Evaluacija hibridnog modela učenja statistike u medicini: kohortna studija" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor prof. dr Nataša Milić, 2022. godine.

3. Kandidat Sonja Grbić, „Analiza socio-demografskih faktora i kliničkih karakteristika obolelih od duševnih poremećaja na meri bezbednosti obaveznog psihijatrijskog lečenja i čuvanja" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor prof. dr Srđan Milovanović, 2022. godine

4. Kandidat Jelena Jović, „Zavisnost od hrane, poremećaji ishrane i afektivni temperament kao prediktori efikasnosti medicinske nutritivne terapije gojaznosti" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor prof. dr Branko Jakovljević i komentor prof. dr Milan Latas, 2022. godine.

5. Kandidat Maja Krstić, „Dizajn, implementacija i evaluacija registra zaposlenih u sistemu zdravstvene zaštite republike Srbije" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor prof. dr Nataša Milić, 2021. godine.

odbrana specijalističkog rada

1. Ivan Soldatović, „Transkulturalna adaptacija i validacija upitnika" odbranjena na Medicinskom fakultetu, Univerzitet u Beogradu, mentor prof. dr Nataša Milić, 2020. godine.

2. Kandidat Mirjana Kostić, „Primena grafičkog prikaza toka klastera i ispitanika u klaster randomizovanim studijama" odbranjena na Medicinskom fakultetu Priština – Kosovska Mitrovica, mentor prof. dr Dejana Stanisavljević, 2019. godine.

odbrana diplomskog rada

1. Obradović Marija. Lečenje infekcija koje se prenose polnim putem. Mentor: Doc.dr Dragana Srebro. Datum polaganja: 2020. godine.

2. Stefan Prlja. Overview of daily number of COVID-19 cases during epidemic in Serbia. Mentor: Prof. dr Nataša Milić. Datum polaganja: 2020. godine.

5. POTVRDA O OCENI STUDENATA

Doc. dr Zoran Bukumirić je pozitivno ocenjen u studentskim anketama: ocenom 4.74 za školsku 2018/19 godinu, ocenom 4.86 za školsku 2019/20 godinu, ocenom 4.74 za školsku 2020/21 godinu i ocenom 4.87 za školsku 2021/22 godinu, prosečna ocena 4.80.

Izborni uslovi - prilog 2

1) ZA STRUČNO-PROFESIONALNI DOPRINOS:

1.3. Broj organizovanih i održanih programa kontinuirane medicinske edukacije na Fakultetu koji nisu ocenjeni ocenom manjom od 3,75 od strane polaznika.

- Organizovao program kontinuirane medicinske edukacije na Medicinskom fakultetu Univerziteta u Beogradu: „Interpretacija rezultata meta-analiza" 2023. godine
- Dao doprinos u organizaciji dva programa kontinuirane medicinske edukacije na Medicinskom fakultetu Univerziteta u Beogradu: „Pretraživanje i pristup medicinskom znanju" 2016. i 2017. godine i „Ispitivanje tačnosti dijagnostičkih testova" 2019 do 2022. godine.

2) ZA DOPRINOS AKADEMSKOJ I ŠIROJ ZAJEDNICI:

2.2 Članstvo u stručnim ili naučnim asocijacijama u koje se član bira ili koje imaju ograničen broj članova

- Član Srpskog farmakološkog društva od 2006. godine.

2.4 Uređivanje časopisa ili monografija priznatih od strane resornog ministarstva za nauku

- Član Uređivačkog odbora časopisa „Engrami" od 2019. godine.

2.6 Rukovođenje ili angažovanje u nacionalnim ili međunarodnim naučnim ili stručnim organizacijama

- Član organizacionog odbora 12 Kongresa farmakologa Srbije i 2. Kongresa kliničke farmakologije Srbije sa međunarodnim učešćem. Palić, 9-12. maj 2007.godine.
- Imenovan od strane Lekarske Komore Srbije za ocenjivanje programa kontinuirane medicinske edukacije od 2023. godine.

3) ZA SARADNJU SA DRUGIM VISOKOŠKOLSKIM, NAUČNO-ISTRAŽIVAČKIM USTANOVAMA U ZEMLJI I INOSTRANSTVU - MOBILNOST:

3.3. Predavanja po pozivu

- Plenarno predavanje: „Evaluacija informacija o zdravlju dostupnih na internetu". Saradnja kao izbor, Nacionalni kongres zdravstvenih radnika Srbije sa međunarodnim učešćem, oktobar 2019. godine.

3.5. Učešće ili rukovođenje u naučnoistraživačkim ili obrazovnim međunarodnim projektima

- Učesnik međunarodnog naučno-istraživačkog projekta: Analiza faktora rizika za nastanak neželjenih dejstava ljekova kod kardioloških bolesnika, odobrenom rešenjem Ministarstva nauke i Ministarstva zdravlja Crne Gore br. 01-405 i 01-2013 od 07.06.2012. godine.

- Učesnik međunarodnog naučno-istraživačkog projekta: PRICOV-19 STUDY, A cross-sectional study in 38 countries on the organization of care in general practices during the COVID-19 pandemic. PRICOV-19 was initiated in the summer of 2020. Under the coordination of 'Quality and Safety Ghent,' an interdisciplinary center of expertise for quality and safety in primary care and transdisciplinary care within the Department of Public Health and Primary Care at Ghent University (Belgium).
- ERAZMUS+ projekat: Development and Implementation of Metacognitive Problem-based Modules in Blended Learning Courses in Medical Sciences (ProBLeMS), broj projekta 101082790, period trajanja 01.04.2023-30.03.2026. godine.

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Na osnovu člana 72 stav 2 Zakona o visokom obrazovanju (Službeni list Crne Gore br. 44/14 i 47/15) i člana 32 stav 1 tačka 9 Statuta Univerziteta Crne Gore, Senat Univerziteta Crne Gore, na sjednici održanoj 04. februara 2016. godine, donio je

O D L U K U
O IZBORU U ZVANJE

DR DRAGAN LAUŠEVIĆ bira se u akademsko zvanje **redovni profesor Univerziteta Crne Gore** za predmete: Epidemiologija i Specijalna epidemiologija na osnovnom akademskom studijskom programu Medicina, na Medicinskom fakultetu.

REKTOR

Prof. Radmila Vojvodić

Prof. dr Dragan Laušević - Biografija

Rođen sam 21.12.1962. godine u Pljevljima, Crna Gora.

Osnovnu školu sam učio u Doboju i Budvi i završio je sa odličnim uspjehom. Srednju školu sam učio u Budvi i Podgorici i završio je sa odličnim uspjehom.

Školske 1982/83. godine započeo sam studije medicine, na Medicinskom fakultetu Univerziteta u Sarajevu. Na istom fakultetu sam diplomirao u januaru 1988. sa prosječnom ocjenom 9,40 (devetčetrdeset). Za postignuti uspjeh tokom studiranja nagrađen sam sa nekoliko diploma Univerziteta u Sarajevu i plaketom Medicinskog fakulteta u Sarajevu "dr Bogdan Zimonjić".

Specijalizaciju iz oblasti epidemiologije započeo sam u decembru 1990. na Medicinskom fakultetu u Beogradu, gdje sam je i završio u januaru 1994. sa odličnim uspjehom i stekao zvanje ljekara specijaliste iz epidemiologije.

Poslijediplomske studije upisao sam školske 1993/1994. godine na Medicinskom fakultetu Univerziteta u Beogradu. Magistarski rad pod naslovom "Epidemiološka studija raka dojke", odbranio sam 9. marta 1998. godine i stekao akademsko zvanje magistra medicinskih nauka.

Doktorsku disertaciju pod nazivom "Studija prevalencije pušenja duvana kod školske djece i omladine u Crnoj Gori" odbranio sam 03. juna 2004. godine na Medicinskom fakultetu Univerziteta u Beogradu.

U nekoliko navrata boravio sam na kraćim studijskim usavršavanjima u inostranstvu:

- 1996. godine - studijsko usavršavanje iz oblasti Infektivnih bolesti i epidemiologije u Salzburg-u, Austrija u organizaciji Medicinskog fakulteta Cornell iz New York-a, USA;

- 1997. godine - studijsko usavršavanje iz oblasti epidemiologije masovnih nezaraznih bolesti u Budimpešti u organizaciji Johns Hopkins University School of Hygiene and Public Health iz Baltimora, USA;

- 1998. godine - studijsko usavršavanje iz oblasti Epidemiologije u javnom zdravstvu (Advanced level course - Epidemiology in Public Health) u organizaciji London School of Hygiene & Tropical Medicine, University of London i WHO European Centre for Environment and Health;

- 2001. godine - studijsko usavršavanje iz oblasti Menadžmenta Programa imunizacija za zemlje Evrope i Centralne Azije u Budimpešti, u organizaciji Svjetske banke i Semmelweis instituta;

- 2006. godine - studijsko usavršavanje iz oblasti Dizajniranja istraživačkih studija u medicini za postdoktorske istraživače u Cavtatu - Dubrovnik u organizaciji Instituta za Globalno Zdravlje Univerziteta u Kaliforniji, USA i Škole narodnog zdravlja „dr Andrija Štampar", Medicinski fakultet Univerziteta u Zagrebu, Hrvatska

- 2007. godine – studijsko usavršavanje za Istraživače iz oblasti Bio-bihejvioralnih tipova istraživanja među skrivenim populacijama uz upotrebu tehmike Uzorkovanja vođenog ispitanicima (Response Driven Sample – RDS) u organizaciji Škole narodnog zdravlja „dr Andrija Štampar", Medicinski fakultet Univerziteta u Zagrebu, Hrvatska

- 2015. godine – studijsko usvršavanje u oblasti upotrebe epidemioloških softvera za obradu epidemioloških podataka u organizaciji Mediteranske škole za primjenjenu epidemiologiju – Institut Karlo III, Madrid, Španija

PODACI O RADNIM MJESTIMA

Period od februara 1988. do februara 1989. godine proveo sam na obaveznom pripravničkom stažu u Kliničko-bolničkom centru Crne Gore i Domu zdravlja u Podgorici.

Od maja 1989. do oktobra 1989. godine radio sam u Domu zdravlja Budva, a od novembra 1989. do avgusta 1999. radio sam u Odjeljenju za epidemiologiju Zavoda za zdravstvenu zaštitu Podgorica.

Od septembra 1999. do maja 2001. godine radio sam u Dječijem fondu Ujedinjenih nacija kao Koordinator zdravstvenog programa za Crnu Goru.

Od maja 2001. do februara 2003. vršio sam dužnost Pomoćnika ministra zdravlja u Vladi Republike Crne Gore.

Od marta 2003. do danas radim u Centru za kontrolu i prevenciju bolesti Instituta za zdravlje Crne Gore.

Od 2016. godine radimu Centru za nauku i kontinuiranu edukaciju Instituta za zdravlje Crne Gore.

PODACI O IZBORIMA U ZVANJE

Odlukama Naučno-nastavnog vijeće Univerziteta Crne Gore iz januara 1992. i 1998. godine stekao sam prvo zvanje Istraživača saradnika, a potom i zvanje Višeg istraživača.

U zvanje asistenta na Katedri za epidemiologiju Medicinskog fakulteta u Podgorici izabran sam u martu 1999. godine.

U zvanje docenta na predmetu epidemiologija na Medicinskom fakultetu u Podgorici izabran sam 2005. godine.

U zvanje vanrednog profesora na predmetu epidemiologija na Medicinskom fakultetu u Podgorici izabran sam 2010. godine.

U zvanje redovnog profesora na predmetu epidemiologija na Medicinskom fakultetu u Podgorici izabran sam 2016. godine.

Dugi niz godina, za potrebe Medicinskog fakulteta Univerziteta u Beogradu obavljam dužnosti mentora za ljekare koji se nalaze na specijalizaciji iz oblasti epidemiologije, a od 2016.g i dužnost mentora-koordinatora za ljekare na specijalizacijiiz epidemiologije.

Bio sam član Nacionalne komisije za sertifikaciju dječije paralize u SR Jugoslaviji, kao i član crnogorskog nacionalnog tima koji je koordinirao uspješnu eradikaciju dječije paralize na prostoru Crne Gore.

Takođe, bio sam član Komisije Vlade RCG za prevenciju narkomanije kod djece i omladine u Crnoj Gori, član radne grupe Ministarstva zdravlja za implementaciju Nacionalnog plana akcije za djecu u RCG i član Komisije za zarazne bolesti Ministarstva zdravlja.

Dugi niz godina sam bio Koordinator Programa imunizacija i "Focal point" za programe obaveznih imunizacija prema Svjetskoj zdravstvenoj organizaciji.

Član sam Nacionalne komisije za kontrolu raka pri Ministarstvu zdravlja.

Takođe, član sam Nacionalnog stručno-savjetodavnog tijela za imunizacije i član Nacionalnog koordinacionog tijela za eliminaciju i eradikaciju pojedinih zaraznih bolesti pri Ministarstvu zdravlja.

Dobitnik sam Zahvalnice Saveznog sekretarijata za rad, zdravstvo i socijalno staranje za doprinos uspješnoj aktivnosti na eradikaciji dječije paralize na prostoru SR Jugoslavije, Zahvalnice Cazasa (Društva za borbu protiv SIDE Crne Gore) i Zahvalnice Crnogorskog društva za borbu protiv raka.

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2. Laušević D, Begić S, Terzić N, Vratnica Z, Čičić A and Mugoša B. Factors Associated with Inconsistent Condom Use with Clients among Female Sex Workers in Podgorica, Montenegro. Srp Arh Celok Lek. 2016 Jul-Aug;144(7-8):424-430. DOI: 10.2298/SARH1608424L. ISSN: 0370-8179.

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5. Laušević D, Begić S, Mugoša B, Terzić N, Vratnica Z, Labović I, Božićevic I. Prevalence of HIV and other infections and correlates of needle and syringe sharing among people who inject drugs in Podgorica, Montenegro: a respondent-driven sampling survay. Harm Reduction Journal 2015:12:2 doi:10.1186/ s12954-015-0039-0. ISSN: 1477-7517 (online).

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IZABRANE PUBLIKACIJE

Prikaži elemenata

Pretraga:

Godina	Kategorija	Autori	Naslov	Izvor
2020	SCI, SCIE, SSCI, A&HCI	Natasa Duborija-Kovacevic, Milica Martinovic, Goran Belojevic, Dragan Lausevic, Bogdan Asanin	Maternal education, health profession and cigarette smoking are decisive factors for self-medication in children by parents	Acta pharmaceutica
2017	SCI, SCIE, SSCI, A&HCI	Mugosa B, Cella E, Lai A, Lo Presti A, Blasi A, Vratnica Z, Vujoševic D, Ebranati E, Lauševic D, Guarino M, Zehender G, Milano T, Pascarella S, Spoto S, Angeletti S, Ciccozzi M	Hepatitis C virus genotype 3A in a population of injecting drug users in Montenegro: Bayesian and evolutionary analysis	Arch Virol
2015	SCI, SCIE, SSCI, A&HCI	Laušević Dragan, Begić Senad, Mugoša Boban, Terzić Nataša, Vratnica Zoran, Labović Itana, Božičević Ivana	Prevalence of HIV and other infections and correlates of needle and syringe sharing among people who inject drugs in Podgorica, Montenegro	Harm reduction journal
2015	SCI, SCIE, SSCI, A&HCI	Martinović Milica, Belojević Goran, Evans Gary W, Laušević Dragan, Ašanin Bogdan, Samardžić Mira, Terzić Nataša, Pantović Snežana, Jakšić Marina, Boljević Jelena	Prevalence of and contributing factors for overweight and obesity among Montenegrin schoolchildren	European Journal of Public Health
2015	SCI, SCIE, SSCI, A&HCI	Vratnica Zoran, Zehender G., Ebranati E., Sorrentino C., Lai A., Vujošević Danijela, Veo C., Lo Presti A., Cella E., Giovanetti M., Laušević Dragan, Galli M., Ciccozzi M., Mugoša Boban	Hepatitis B virus genotype and subgenotype prevalence and distribution in Montenegro	Journal of medical virology
2014	SCI, SCIE, SSCI, A&HCI	Martinović, M, Belojević, G., Evans, GW., Ašanin,B. Laušević, D., Duborija Kovačević, N., Samardžić, M., Jakšić, M. & Pantović, S.	Blood Pressure among Rural Montenegrin Children in Relation to Poverty and Gender	European Journal of Public Health
2013	SCI, SCIE, SSCI, A&HCI	Baćak, V., Laušević, D., Mugoša, B., Vratnica, Z. & Terzić, N.	Hepatitis C Virus Infection and Related Risk Factors among Injection Drug Users in Montenegro	European Addiction Research
2013	SCI, SCIE, SSCI,	Zehender, G., Sorrentino, C., Lai, A., Ebranati, E., Gabanelli,	Reconstruction of the Evolutionary Dynamics of	Infection, Genetics

Godina	Kategorija	Autori	Naslov	Izvor
	A&HCI	E., Lo Presti, A., Vujošević, D., Laušević, D., Terzić, D., Shkjezi, R., Bino, S., Vratnica, Z., Mugoša, B., Galli, M., Ciccozzi, M.	Hepatitis C Virus Subtypes in Montenegro and the Balkan Region	and Evolution
2012	SCI, SCIE, SSCI, A&HCI	Ciccozzi, M., Lai, A., Ebranati, E., Gabanelli, E., Galli, M., Mugoša, B., Vratnica, Z., Vujoševic, D., Laušević, D., Ciotti, M., Cella, E., Lo Presti, A. & Zehender, G.	Phylogeographic Reconstruction of HIV Type 1B in Montenegro and the Balkan Region	AIDS Research and Human Retroviruses
2011	SCI, SCIE, SSCI, A&HCI	Ciccozzi, M., Vujošević, D., Lo Presti, A., Mugoša, B., Vratnica, Z., Lai, A., Laušević, D., Drašković, N., Marjanović, A., Cella, E., Santoro, MM., Alteri, C., Fabeni, L., Ciotti, M. & Zehender, S.	Genetic Diversity of HIV Type 1 in Montenegro	AIDS Research and Human Retroviruses

Prikaži elemenata

Pretraga:

Godina	Kategorija	Autori	Naslov	Izvor
2009	SCI, SCIE, SSCI, A&HCI	Werber, D., Laušević, D., Mugoša, B., Vratnica, Z., Ivanović-Nikolić, L., Žižić, L., Alexandre-Bird, A., et al.	Massive outbreak of viral gastroenteritis associated with consumption of municipal drinking water in a European capital city	Epidemiology and Infection

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Na osnovu člana 75 stav 2 Zakona o visokom obrazovanju (Sl.list RCG, br. 60/03 i Sl.list CG, br. 45/10 i 47/11) i člana 18 stav 1 tačka 3 Statuta Univerziteta Crne Gore, Senat Univerziteta Crne Gore, na sjednici održanoj 19.12.2013. godine, donio je

ODLUKU
O IZBORU U ZVANJE

Dr sci med. MILICA MARTINOVIĆ bira se u akademsko zvanje **redovni profesor** Univerziteta Crne Gore za predmet: Patološka fiziologija i labaratorijska medicina, na Medicinskom fakultetu.

REKTOR
Prof. dr Predrag Miranović

BIOGRAFIJA

Rodjena 29.X 1960. g. U Nikšiću , Crna Gora. Osnovnu školu i gimnaziju završila u Nikšiću. Diplomirala na Medicinskom fakultetu Univerziteta u Beogradu 1983.g. Specijalizaciju iz pedijatrije završila 1992.g, položivši sa odličnom ocjenom specijalistički ispit, na Institutu za zdravstvenu zaštitu majke i deteta Medicinskog fakulteta Univerziteta u Beogradu. Magistarski rad pod nazivom „ Komparativna studija etiopatogenetskih i kliničkih parametara bronhijalne astme sa efektima terapije u kontinentalnom i priobalnom dijelu Crne Gore" odbranila 1997.g. na Medicinskom fakultetu Univerziteta u Nišu, Srbija. Zvanje doktora medicinskih nauka stekla na Medicinskom fakultetu Univerziteta u Nišu, odbranivši doktorsku disertaciju pod nazivom „ Uloga i značaj primjene inhalacionih glikokortikoida u prevenciji dječije astme".

Od 1999. Zaposlena na Medicinskom fakultetu Univerziteta Crne Gore, na predmetu Patološka fiziologija i laboratorijska medicina. U zvanje docenta izabrana 2003.g., vanredni profesor 2008., a u zvanje redovni profesor 2013.g.

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4. Aleksandra Klisić, Nebojša Kavarić, Bojko Bjelaković, Ivan Soldatović, Milica Martinović, Jelena Kotur-Stevuljević Povezanost retinol-vezujućeg proteina 4 i kardiovaskularnog rizika posredovana je obimom struka kod pretilih/debelih adolescentica Acta clinica Croatica, Vol.56. No.1. (str.98-98), mart 2017.
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Radovi objavljeni u časopisima koji se ne nalaze u međunarodnim bazama podataka

14. Milica Martinović, Sigurnosni profil inhalacionih kortikosteroida (beclomethason dipropionat)primijenjenih u konvencionalnim i u visokim dozama u prevenciji dječje astme, ACTA MEDIKA MEDIANAE, ISSNYU 0365-4478, Vol.47, No.1,2008.

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17. Martinović M., Inhaled corticosteroids: the role in the prevention of asthma, pathophysiological and clinical aspects, Jurnal Medical Brasovean, Brashov, 2012, ISSN 1841-0782.nr.2-2012

PROJEKTI

1. Rukovodilac crnogorskog nacionalnog naučno-istraživačkog projekta " Istraživanje siromaštva i gojaznosti kod školske djece u Crnoj Gori- klinički, patofiziološki, biohemijski i preventivni aspekti", 2013-2015.

2. Koordinator za Medicinski fakultet u Podgorici CEEPUS projekta: » Developing a network for monitoring the impact of environmental and nutritional factors on fertility and neonatal health«, Network Coordinator assoc.prof Marius Moga, Transilvania University of Brashov, Romania, 2007- 2013

3. Rukovodilac crnogorskog tima u bilateralnom crnogorsko-hrvatskom projektu : „ Komparativna studija o uticaju siromaštva na pothranjenost i gojaznost, dijetetske navike i životni stil kod skolske djece Podgorice i Osijeka" Član istraživačkog tima

4. CRNOGORSKO-SRPSKI BILATERALNI PROJEKAT: „Značaj praćenja odnosa mokraćnwe kisjeline i oksidativnog stresa u definisanju kardiovaskularnog rizika metabolički zdrave i metabolički bolesne djece sa viškom tjelesne mase" (The importance of monitoring the interrelation between urls acid and oxidative stress in defining cardiovascular risk at metabolically healthy and sick children with excess body weight"), član istraživačkog tima

5. Competency based Curriculum Reform in Nursing and Caring in Western Balkan Universities 544169-TEMPUS-1-2013-1-BE-TEMPUS-JPCR, rukovodilac prof.dr Bogdan Ašanin, član istraživačkog tima

6. Član istraživačkog tima u projektu Ministarstva nauke CG- „Balneološki efekti peloida, mineralne vode, ljekovitog i aromatičnog bilja na inflamatorni odgovor kod reumatoidnih i kardiovaskularnih bolesti", rukovodilac doc.dr Snežana Pantović

7. Član istraživačkog tima u projektu Ministarstva nauke CG- „Procjena jodnog statusa, razvoj i standardizacija preventivnog programa u Crnoj Gori", rukovodilac prof.dr Mira Samardžić

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MEDICINSKI FAKULTET

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Na osnovu člana 72 stav 2 Zakona o visokom obrazovanju („Službeni list Crne Gore" br. 44/14, 52/14, 47/15, 40/16, 42/17, 71/17, 55/18, 3/19, 17/19 47/19, 72/19, 74/20 i 104/21) i člana 32 stav 1 tačka 9 Statuta Univerziteta Crne Gore, Senat Univerziteta Crne Gore na sjednici održanoj 15.12.2021. godine, donio je

ODLUKU
O IZBORU U ZVANJE

Dr Tanja Boljević bira se u akademsko zvanje docent Univerziteta Crne Gore za oblasti **Hirurška grupa kliničkih medicinskih predmeta i Maksilofacijalna hirurgija** na Medicinskom fakultetu Univerziteta Crne Gore, na period od pet godina.

SENAT UNIVERZITETA CRNE GORE
PREDSJEDNIK

Prof. dr Vladimir Božović, rektor

Biografija - Boljevic Tanja

Edukacija:

Osnovna škola (1984-1993) i Srednja Medicinska škola (1993-1997) u Podgorici sa odličnim uspjehom i diplomom "Luča", Medicinski fakultet (1997-2004) u Podgorici sa prosječnom ocjenom 8.52.

Postdiplomska edukacija:

Odbranila je magistraski rad pod nazivom " Ispitivanje činilaca koji utiču na oporavak anemije bolesnika na hemodijalizi tokom liječenja rekombinantnim eritropoetinom " na Medicinskom fakultetu u Podgorici (12.jula, 2013) kod mentora Prof. dr Marina Ratković sa odličnom ocjenom i stekla naziv magistra medicinskih nauka. Octobra 2014. završila je specijalizaciju iz Maksilofacijalne hirurgije na Medicinskom fakultetu Univerziteta u Beogradu, sa odličnom ocjenom i stekla zvanje specijaliste maksilofacijalne hirurgije. Odbranila je doktorsku disertaciju pod nazivom " Uticaj karakteristika traume i izbora hirurškog pristupa na rezultate lečenja bolesnika sa prelomom kostiju lica " 4.11.2019. na Medicinskom fakultetu u Nišu, Republika Srbija, pa tako stekla zvanje doktora medicinskih nauka. Docent je na Medicinskom fakultetu u Podgorici od 15.12.2021.godine.

Stručna praksa:

Izabrani doktor u Kliničkom centru Crne Gore (maj 2006, jedan mjesec). Predavač u Srednjoj Medicinskoj školi u Podgorici (2005/2006, jedna godina) na predmetu Higijena. Doktor medicine u Hitnoj medicinskoj pomoći u Podgorici (2006-2008, 24 mjeseca) I kao najbolji ljekar 2007.godine. Specijalizant (2008-2014) i specialista maksilofacijalne hirurgije (od 2014., pa I dalje) u Klinici za ORL i MFH u Kliničkom centru Crne Gore. Asistent na predmetu Anatomija na Medicinskom fakultetu u Podgorici (2008/09, jedna godina). Asistent na predmetu Otorinolaringologija sa Maksilofacijalnom hirurgijom na Medicinskom fakultetu na odsjeku za medicinu i na predmetu Maksilofacijalna hirurgija na odsjeku za stomatologiju, Univerziteta Crne Gore (od 2015.god), a od školske 2020/21.god i kao predavač na istim predmetima, a od januara 2022.godine je istekla zvanje docenta medicinskih nauka na ovom fakultetu.

Članstva:

Balkansko udruženje maksilofacijalnih hirurga (BAMS) kao predstavnik iz Crne Gore; Ljekarske komore Crne Gore; Evropsko udruženje maksilofcijalnih hirurga, Pridruženi član Udruženja maksilofacijalnih hirurga Srbije; Pridruženi član Udruženja otorinolaringologa Crne Gore; Etički komitet (po odluci Vlade Crne Gore od 11.03.

2021.god ("Službeni list CG ", br. 17/19)) kao predstavnik Medicinskog fakulteta; Aktivni učesnik i jedan od osnivača društva za borbu protiv HIV-a "CAZAS"; Sudski vještak iz medicinske struke, iz oblasti maksilofacijalne hirurgije.

Članstva u projektima:

Internacionalni projekat "COST" Action (2016, 2017; dvije godine), COST IS1210 (European Cooperation in Science and Technology) za dio koji se odnosi na rascjepe, kao prestavnik iz Crne Gore. Internacionalni projekat (započet 2018.god) CA16234, ECCE (European Cleft and Craniofacial Initiative for Equality of Care) koji se odnosi na deformitete lica.

Drugo: Rođena Brajović u Podgorici, 19.11.1978. Aktivno se služi znanjem engleskog jezika.

Učestvovala je kao predavač: Skup društva za estetiku Crne Gore pod nazivom "Cudel" sa temom "Anatomija lica"(April, 2019, Bečići). Simpozijum ORL Crne Gore (Octobar 3-5, 2019) u Podgorici, Crna Gora, sa temom " Osteonekroza mandibule usled upotrebe bifosfonata u terapiji carcinoma dojke- prikaz slučaja". Učestvovala je kao predavač na više naučnik skupova u Crnoj Gori iz oblasti maksilofacijalne hirurgije u sklopu edukacije lekara Crne Gore, a kao predstavnik iz Kliničkog centra Crne Gore. Oktobra 2019.godine je dobila zahvalnicu od Medicinskog fakulteta Univerziteta Crne Gore i Organizacionog odbora MIMS-a za održanu radionicu kao edukator u sklopu Montenegrian International Medical Summit (MIMS 2019).

Učestvovanje na kongresima i simpozijumima: Simpozijum " Svetskog dana glasa - pseudotumori larinksa" Klinike za ORL I MFH, Kliničkog centra Srbije (April 23, 2014) u Beogradu. "II International ONKO / CT Symposium" (Novembar 28, 2008) Budva. Simpozijum stomatologa (1.6. 2012) u Novom Sadu pod nazivom " Estetika u restaurativnoj stomatologiji " i Simpozijum (2.6.2012.) pod nazivom " Estetika u hirurškoj pripremi pacijenata ". Kongres stomatologa Vojvodine (May 16-17, 2015) in Novi Sad, Serbia. Simpozijum Stomatološke komore Serbije u Beogradu (17.11.2016.) pod nazivom " Značaj ranog otkrivanja oralnog carcinoma ". Stručni skup pod nazivom " Odabrane teme u maksilofacijalnoj hirurgiji" (4.6.2015.) u Bijeljini, Republika Srpska. XI Kongres Hrvatskog udruženja maksilofacijalne, plastične i rekonstruktivne hirurgije glave i vrata (27-29, 11.2014.) u Kliničko Bolničkom centru Dubrava.

Kontinuirana medicinska edukacija: Boravak u Klinici za ORL i MFH, Klinički centar Srbije u Beogradu u periodu od 18-23.6.2018.godine zbog edukacije. Klinike za ORL i MFH, Kliničkog centra Srbije u Beogradu: "BPPV kao najčešća vrtoglavica "(3.3.2014.). " Disfagija kod pacijenata sa malignitetima glave i vrata "(12.5.2014). " Strana tijela donjih disajnih puteva "(16.12.2013.). "Vrtoglavice "(21.10.2013.). Ljekarska komore

Crne Gore pod nazivom " Hemomycin-urogenitalne infekcije" i " Hemomycin-pulmonalne infekcije"(2.11.2009.).

Pohađala je kurseve: (Life Long Learning) pod nazivom "Enteralna ishrana" (Approach to Enteral Nutrition) održanog u Beogradu (28.3.2017.) od strane Nacionalnog udruženja za parenteralnu i enteralnu ishranu Srbije. Kursa " Rhythm disorders and pacineg", održanog od strane Serbian society of emergency physicians u Nišu (26.5.2016.). Simpozijum "Značaj dentogenih infekcija u stomatološkoj praksi" Udruženja za estetsku stomatologiju Srbije (ESS) (27.10.2018.) u Beogradu. Simpozijum "Sinergy" " Udruženja za estetsku stomatologiju Srbije (ESS) (29.10.2018.) u Beogradu. Učesnica je više domaćih i inostranih kongresa sa autorskim i koautorskim radovima u vidu usmenih prezentacija ili prezentacija u vidu postera.

Tretman sa hijaluronskom kisjelinom u predjelu lica (14.5.2019.) u Podgorici. Udruženje za estetiku Crne Gore pod nazivom "Cudel" (April, 2019, Becici) „Tretman sa „PRP" .

Trenutno na sci listi ima objavljena 2 autorska i 2 koautorska rada. U drugim prestižnim časopisima ima objavljenih još 6 autorskih i 6 koautorska radova.

Lista objavljenih radova u prestižnim časopisima:

1. **T Boljevic**, B Vukcevic, S Pajic, Z Pesic. Oral Health–Related Quality of Life of Patients Undergoing Different Treatment of Facial Fractures: The OHIP-14 Questionnaire. Nigerian Journal of Clinical Practice. 2019 Sept;22(9):1213-1217. **IF: 0,43 (M21) Q3**
2. **Boljevic T**, Vukcevic B, Pesic Z, Boljevic A. The Quality of Life of Patients with Surgically Treated Mandibular Fractures and the Relationship of the Posttraumatic Pain and Trismus with the Postoperative Complications: A Prospective Study. *Medicina* 2019, *55*, 109; doi:10.3390/medicina55040109. **IF: 467** (2018) ; **(M22) Q3**
3. Miroljub Todorovic, Batric Vukcevic, Milenko Cabarkapa, Nemanja Vukcevic, **Tanja Boljevic**,Nemanja Radojevic. The assessment of airbag deployment and seatbelt use in preventing facial injuries. Forensic Sci Med Pathol. 2018 Dec;14(4):503-508. doi: 10.1007/s12024-018-0020-9. Epub 2018 Aug 28. **IF: 1.815 (2018) (M22) Q2**
4. Pesic Z, Pejcic A, **Boljevic T**. A Foreign Body in Infant Palate: A Case Report. West Indian Medical Journal,2016. DOI: 7727/wimj.2015.577 **IF: 0.186 (M23) Q4**
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6. **Boljevic T,** Srbislav P, Todorovic M, Jovanovic S, Stankovic A, Djordjevic M. Complications Associated with surgical treatment of facial fractures. Global Journal for Research Analysis.;Volume 7, Issue 7;Jully 2018,ISSN 2277 -8160; DOI : 10.15373/22778160. **(M51) Q5**
7. Pajić,**T.Boljević**,S.Antić,M.Mrvaljević,M.Cojić,J.Janić,Z.Pešić. Mesto i uloga Titanijum mesha-a u rekonstrukciji čeonog sinusa nakon traume. Timočki medicinski glasnik, (2017). Vol.42, Supplement br. 1, str. 5-11. **(M52)**

8. Mia Stiernman, Ieva Maulina, Inta Zepa, Triin Jagomägi, Nenad Tanaskovic, Predrag Knežević, Radost Velikova, Youri Anastassov, Julija Radojićić, Zoran Pesic, Branislav Trifunović, Martina Drevensek, Radu Spataru, **Tanja Boljevic**, Radmila Dimovska, Slave Naumovski, Nichola Rumsey, Fabio Zucchelli, Nicholas Sharratt, Mario Argyrides, Kristina Klintö, Magnus Becker, Martin Persson. Translation and pilot study of the Cleft Hearing Appearance and Speech Questionnaire (CHASQ). European Journal of Plastic Surgery. 2019;1-10. IF:0,37. **(M23)**
9. **T Boljevic**, S Pajic. Optimal Use of Skin Thiersch Graft. Journal of Pharmacy and Pharmacology 5 (2017) 215-222. DOI:10.17265/2328-2150/2017.04.006. IF: 2,405. **(M51) Q5**
10. Srbislav Pajić, **Tanja Boljević**, Svetlana Antić, Milutin Mrvaljević, Milena Cojić, Jovan Janić, Zoran Pešić. PROPTOSIS AND DIPLOPIA AS CONSEQUENCES IN TRAUMA OF CRANIOFACIAL JUNCTION. Facta Universitati, Medicine & Biology.2017; 19 (1). (**K52)**
11. Srbislav Pajić, **Tanja Boljević**, Svetlana Antić, Milutin Mrvaljević, Milena Cojić, Jovan Janić. MUKOKELA U SUBMANDIBULARNOJ PLJUVAČNOJ ŽLEZDI–PRIKAZ SLUČAJA I LITERATURNI PREGLED MUCOCELE IN THE SUBMANDIBULAR SALIVARY GLAND-CASE REPORT AND. Timočki medicinski glasnik.2017; 42(1): 48-52. UDK 616.316-003.4 **(K52)**
12. Miroljub Todorovic, **Tanja Boljevic**. Undifferentiated Sinonasal Carcinoma—Case Report. Journal of Pharmacy and Pharmacology 7 (2017) 434-438 doi: 10.17265/2328-2150/2017.07.007 **(M51) Q5**
13. **Boljević T**, Zvrko E. Tumori parotidne pljuvačne žlijezde u Crnoj Gori- retrospektivna studija kod 210 pacijenata. Medicinski zapisi, 2016.65(2):17-23.
14. Zvrko E, **Boljević T**. Malignant tumors of the nose and paranasal sinuses. Medicinski zapisi, 2016.65(2):17-23.
15. **Boljevic T**, Zvrko E. Tuberkuloza parotidne žlijezde-prikaz slučaja. Medicinski zapisi, 2016.65(2):17-23.
16. **Boljevic T**, Pelicic D. Anemia of Patients on Hemiodialysis During Treatment with Recombinant Erythropoietin. Biomedical Journal of Scientific & Technical Research.2020.;Volume 31- Issue 5:24561-4. DOI: 10.26717/BJSTR.2020.31.005173. IF: 1,095. **(M51) Q5**

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