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EDITORIJAL



„Da biste postali dobri u bilo čemu, morate da znate kako da primenite osnovne principe. Da biste postali sjajni u tome, morate da znate kada da prekršite te principe.“

Gari Kasparov, jedan od najboljih šahista svih vremena

Poštovane kolegice i kolege,

Još malo pa će se navršiti dve godine od kada sam imao čast da napišem editorijal za broj „Srpskog medicinskog časopisa Lekarske komore“ koji je objavljen na samom kraju 2023. godine.

Početak je obećavao, puno truda je uloženo, i rezultat nije izostao – stigli smo, evo, i do 21. broja. Rekao bih da je to impresivno, u uslovima kada se za Časopis malo ili nimalo znalo, kada motiva nije bilo previše, i kada uspeh nije bio zagarantovan. Uredništvo, čiji sam ponosni član, dodelilo mi je ovu ulogu, na kojoj sam zahvalan. Nadam se da moj skromni doprinos radu i razvoju „Srpskog medicinskog časopisa Lekarske komore“ ipak znači. I dalje duboko verujem da kroz Časopis, svi mi pojedinačno, doprinosimo daljem razvoju struke i nauke kod nas. Svako na svoj način – malo nauke, malo analize, malo prikaza, malo stručnih rešenja. Sve to zajedno i čini Časopis zanimljivim, i verujem da će sve više i više čitalaca to i uvideti.

Dozvolite da vam predstavim dvadeset prvi broj Časopisa, nastao zajedničkim naporima Uredništva, saradnika, autora i recenzenata.

Ovaj broj otvara rad po pozivu, kolegica Goldner Vukov (*Counties Manukau -Te Whatu Ora*, Okland, Novi Zeland) i Mijalković, „Promovisanje rezilijentnosti i blagostanja kod pojedinca, porodice i zajednice tokom psihosocijalne krize“. Rad istražuje dinamiku psihosocijalne krize i načine promovisanja rezilijentnosti i blagostanja na nivou pojedinca, porodice i zajednice. Pregled literature koja tretira traumom kao izazivača psihosocijalne krize, analizira ovo stanje nestabilnosti i opasnosti. Autorke zaključuju da se trauma mora obraditi na odgovarajući način, u suprotnom ona traje duže i može da dovede do transgeneracijske i međugeneracijske traume i omesti lični, porodični i društveni rast i razvoj.

Sledi originalni rad kolege Nedovića i saradnika koji ispituje mogućnosti korišćenja senzora inercijalne merne jedinice za procenu sposobnosti održavanja ravnoteže kod starijih osoba. Čak trideset četiri zdrava ispitanika starija od 65 godina su bili učesnici ovog istraživanja. Ravnoteža je procenjivana korišćenjem senzora tokom stajanja u trajanju od trideset sekundi, a učesnici stariji od 75 godina su pokazali povećane oscilacije tela u odnosu na mlađu grupu, pa se može reći da ovako bazirana procena ravnoteže pokazuje osetljivost u otkrivanju suptilnih promena povezanih sa starošću, sa praktičnim prednostima u bolničkim i drugim ustanovama.

EDITORIAL

"To become good at anything, you have to know how to apply basic principles. To become great at it, you have to know when to violate those principles."

Garry Kasparov, one of the greatest chess players of all time

Dear colleagues,

It will soon be two years since I had the honor of writing the editorial for the issue of the *Serbian Journal of the Medical Chamber*, published at the very end of 2023.

The inception was promising, great effort was invested, results were not lacking, and we have arrived at issue number 21. I feel this is impressive, considering the conditions wherein the Journal was little known, when there was little motivation, and success was far from guaranteed.

The Editorial Office, of which I am a proud member, entrusted me with this role, for which I am grateful. I can only hope that my modest contribution to the operation and development of the *Serbian Journal of the Medical Chamber* is meaningful. It is my profound belief that through this Journal, each of us individually contributes to the further development of medical science and the medical profession – each in our own way, with our share of scientific insight, analysis, reporting, and expertise. All of this together makes the Journal interesting, and I believe more and more readers will come to recognize that.

Allow me to present the twenty-first issue of the Journal, created through the joint effort of the Editorial Office, our associates, authors, and reviewers.

This issue opens with an invited paper by our colleagues Goldner Vukov (Counties Manukau -Te Whatu Ora, Auckland, New Zealand) and Mijalković titled "Promoting resilience and wellbeing for individuals, families, and communities in psychosocial crises". The paper explores the dynamics of psychosocial crises and ways to promote resilience and well-being at the individual, family, and community levels. A review of the literature dealing with trauma as a trigger for psychosocial crises analyzes this state of instability and danger. The authors conclude that trauma must be appropriately addressed; otherwise, it can persist longer and lead to transgenerational and intergenerational trauma, hindering personal, family, and societal growth and development.

Next is an original research paper by our colleagues Nedović et al., which examines the potential use of inertial measurement unit (IMU) sensors to assess balance abilities in senior adults. A total of 34 healthy participants over the age of 65 took part in the study. Balance ability was assessed using the sensors during a 30-second semi-tandem stance. Participants over the age of 75 years showed greater

U ovom broju predstavljamo i četiri pregledna rada.

Kolege Miljković i Koprivica razmatraju javnozdravstvene aspekte zloupotrebe i neadekvatnog korišćenja antibiotika. U pregled literature uključeni su radovi objavljeni u periodu od 2010. do 2024. godine, sa fokusom na analizu nepravilne upotrebe antibiotika. Rezultati pokazuju da su najčešći uzroci neadekvatne terapije samoinicijativno uzimanje lekova, propisivanje antibiotika bez mikrobiološke potvrde i loša komunikacija između lekara i pacijenta, te preporučuju integrisani pristup kao ključan za očuvanje efikasnosti postojećih lekova i smanjenje javnozdravstvenog opterećenja.

U svom radu, Biljana Vukčević Lacković analizira prvih pet godina izlaženja „Srpskog medicinskog časopisa Lekarske komore“. Rad predstavlja sažeti osvrt i konciznu analizu različitih vrsta radova i tema pokrivenih u dosadašnjim brojevima Časopisa, dajući uvid u ono što Časopis pruža i čitaocima i autorima.

Autori Petrović i Stevanović u svom radu opisuju duktalni karcinom *in situ* (DCIS) i pregled aktuelnih multidisciplinarnih pristupa dijagnostici i lečenju DCIS-a zasnovanih na najnovijim saznanjima iz naučne literature. No, mamografija i dalje ostaje primarna dijagnostička metoda.

Inostrani autor Mateus Guziak predstavlja 30 godina specijalizacije iz porodične medicine u Poljskoj u studiji slučaja institucionalizacije, prakse i percepcije pacijenata u okviru primarne zdravstvene zaštite. Rad počinje opisom procesa uvođenja specijalizacije iz porodične medicine u Poljskoj, što je učinjeno u okviru širih reformi zdravstvenog sistema, usmerenih na restrukturiranje primarne zdravstvene zaštite. Rezultati govore da je specijalizacija iz porodične medicine stekla pun klinički i akademski legitimitet u Poljskoj. Data je preporuka o daljim reformama, uz unapređenje veština komunikacije i promovisanje porodičnih lekara.

Autori Jovanović, Jovanović, Milinković, Dunđerović i Jovanović daju prikaz slučaja koji odslikava značaj preventivne ultrazvučne dijagnostike u pravovremenoj detekciji retkih i agresivnih tireoidnih karcinoma. Naglašava se značaj precizne ultrazvučne dijagnostike, presudne u ranoj detekciji, te primeni adekvatnih hirurških postupaka u zbrinjavanju ovako agresivnih formi bolesti. Prikazuje se pacijentkinja kod koje je rana detekcija i pravovremeni terapijski pristup u lečenju mikromedularnog karcinoma štitaste žlezde promenila terapijski ishod i prognozu bolesti.

Poslednji rad u ovom broju, autora Vasović, Rašić i Mitrović – „Sklerohoroidalna kalcifikacija – diferencijalno-dijagnostička dilema: prikaz slučaja“, prikazuje slučaj pacijenta upućenog na evaluaciju subretinalne lezije lokalizovane na periferiji očnog dna. Autori zaključuju da se sklerohoroidalne kalcifikacije mogu klinički i ultrazvučno imitirati ozbiljnije intraokularne promene.

Na kraju, preostaje da ponovo pozovem kolege, kliničare, istraživače, nastavnike, da nam se pridruže u doprinosu Časopisu, da ga uvrste u svoja razmišljanja, kako bismo ga zajedno obogatili i učinili potrebnim u našem daljem profesionalnom radu.

Srdačno,

Dr Saša Radovanović, naučni savetnik,

Institut za medicinska istraživanja Univerziteta u Beogradu,

Institut od nacionalnog značaja za Republiku Srbiju

body sway compared to the younger group. Thus, this sensor-based balance assessment demonstrates sensitivity in detecting subtle age-related changes, offering practical benefits in clinical and community settings.

This issue also includes four review papers.

Our colleagues Miljković and Koprivica examine the public health aspects of antibiotic misuse and inappropriate use. This literature review includes papers published between 2010 and 2024, focusing on the analysis of improper antibiotic use. The results show that the most common causes of inadequate treatment are self-medication, prescribing antibiotics without microbiological confirmation, and poor communication between doctors and patients. An integrated approach is recommended as key to preserving the effectiveness of existing drugs and reducing the public health burden.

In her article, Biljana Vukčević Lacković analyzes the first five years of publication of the *Serbian Journal of the Medical Chamber*. The article provides a concise overview and analysis of the types of papers and topics covered in previous issues, offering insight into what the Journal brings to both readers and authors.

Authors Petrović and Stevanović describe ductal carcinoma *in situ* (DCIS) and review current multidisciplinary approaches to the diagnosis and treatment of DCIS based on the latest scientific findings. Nevertheless, mammography remains the primary diagnostic method.

International author Mateusz Guziak reports on thirty years of the family medicine specialty in Poland, presenting a case study on the institutionalization, practice, and patient perception of family medicine within primary healthcare. The article begins with a description of the process of introducing the family medicine specialty in Poland, which was part of broader healthcare system reforms aimed at restructuring primary care. The results indicate that the family medicine specialty has gained full clinical and academic recognition in Poland. Recommendations are given for further reforms, including improved communication skills and visibility of family physicians.

Authors Jovanović, Jovanović, Milinković, Dunđerović, and Jovanović present a case report reflecting the importance of preventive ultrasound diagnostics in the timely detection of rare and aggressive thyroid cancers. The importance of precise ultrasound diagnostics is emphasized as crucial for early detection and administration of appropriate surgical procedures in treating such aggressive forms of disease. The case involves a female patient in whom early detection and timely treatment of micromedullary thyroid carcinoma significantly changed the outcome and prognosis of the disease.

The final article in this issue, by authors Vasović, Rašić, and Mitrović, titled *Sclerochoroidal calcification mimicking choroidal osteoma: A case report*, presents the case of a patient referred for evaluation of a subretinal lesion located in the periphery of the ocular fundus. The authors conclude that sclerochoroidal calcifications can clinically and ultrasonographically mimic more serious intraocular conditions.

In conclusion, I once again invite all colleagues – clinicians, researchers, educators – to join us in contributing to the Journal, to consider it in their work and reflections, so that together we can enrich the Journal and make it an essential part of our continued professional efforts.

Sincerely,

Dr. Saša Radovanović, Senior Research Fellow
University of Belgrade, Institute for Medical Research
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OF RARE AND AGGRESSIVE THYROID CARCINOMAS – CASE REPORT 341

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PROMOVISANJE REZILIJENTNOSTI I BLAGOSTANJA KOD POJEDINCA, PORODICE I ZAJEDNICE TOKOM PSIHOSOCIJALNE KRIZE

RAD PO POZIVU

INVITED PAPER

PROMOTING RESILIENCE AND WELL-BEING FOR INDIVIDUALS, FAMILIES, AND COMMUNITIES IN PSYCHOSOCIAL CRISIS

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SAŽETAK

Uvod: Procenjuje se da oko 70% ljudi doživi bar jedan ozbiljan traumatski događaj tokom života. Trauma obično izaziva psihosocijalnu krizu, koja predstavlja stanje nestabilnosti i opasnosti. Trauma i psihosocijalna kriza razmatraju se na nivou pojedinca, porodice i zajednice. Promovisanje rezilijentnosti i blagostanja u velikoj meri pomaže da se osoba „povrati” nakon suočavanja sa nedaćama.

Cilj: Ovaj rad istražuje dinamiku psihosocijalne krize i načine promovisanja rezilijentnosti i blagostanja na nivou pojedinca, porodice i zajednice.

Materijali i metode: Sproveden je pregled literature o psihosocijalnoj krizi, njenim uzrocima i posledicama, kao i o rezilijentnosti i blagostanju kao ključnim resursima za suočavanje sa ovim izazovima.

Rezultati: „Faktori otpornosti” – kao što su optimizam, suočavanje sa sopstvenim strahom, jasno definisane moralne vrednosti, vera i duhovnost, socijalna podrška, kognitivna i emocionalna fleksibilnost, kao i osvešćeni doživljaj životnog smisla – imaju ključnu ulogu u suočavanju sa psihosocijalnom krizom. Blagostanje se dodatno može unaprediti fokusiranjem na fizičko zdravlje, negovanjem socijalnih kontakata i putem mentalne stimulacije.

Zaključak: Psihosocijalna kriza se može posmatrati na više nivoa – razvojnog, situacionog, egzistencijalnog, duhovnog i na nivou slučajnih događaja. Ukoliko se trauma adekvatno ne obradi i kriza potraje, to može dovesti i do intergeneracijskih i transgeneracijskih trauma. Jačanje rezilijentnosti i unapređivanje blagostanja na nivou pojedinca, porodice i društva predstavlja ključnu strategiju za suočavanje sa traumom i ublažavanje negativnih posledica kao što su PTSP, zlostreba psihoaktivnih supstanci, suicidalnost, depresija i problemi fizičkog zdravlja. Unapređivanjem rezilijentnosti i blagostanja traumatska iskustva i psihosocijalne krize se mogu transformisati u prilike za lični, porodični i društveni rast i razvoj.

Ključne reči: trauma, psihosocijalna kriza, rezilijentnost, blagostanje

ABSTRACT

Introduction: It is estimated that up to 70% of people experience at least one serious traumatic event during their lives. Trauma usually causes a psychosocial crisis, which is a state of instability and danger. Trauma and the psychosocial crisis are addressed at the level of the individual, the family, and the community. Promoting resilience and well-being is very useful in helping a person “bounce back” after encountering adversity.

Objective: This paper explores the dynamics of psychosocial crisis and the ways of promoting resilience and well-being at the individual, family, and community levels.

Materials and methods: A literature review was conducted on psychosocial crises, their causes and consequences, as well as on resilience and well-being as key resources for addressing these challenges.

Results: Resilience factors – such as optimism, facing one's fear, a strong moral compass, religion and spirituality, social support, cognitive and emotional flexibility, and a sense of meaning and purpose – play a crucial role in coping with psychosocial crises. Well-being can be further enhanced by prioritizing physical health, nurturing social connections, and engaging in mental stimulation.

Conclusion: Psychosocial crises can be observed on several levels – maturational, situational, existential, spiritual, and adventitious. If trauma is not properly addressed and the crisis persists, it may lead to both intergenerational and transgenerational trauma. Strengthening resilience and enhancing well-being at the levels of the individual, family, and society are essential strategies for coping with trauma and mitigating negative outcomes such as PTSD, substance abuse, suicidality, depression, and physical health problems. By fostering resilience and well-being, traumatic experiences and psychosocial crises can be transformed into opportunities for personal, family, and social growth and development.

Keywords: trauma, psychosocial crisis, resilience, well-being

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UVOD

Učestalost psihosocijalnih kriza može značajno da varira u zavisnosti od primenjenih definicija, populacije koja se proučava (na primer, opšta populacija u poređenju sa osobama koje imaju hroničnu bolest ili prethodnu istoriju traume), kao i konteksta ili okruženja (kao što su siromašna područja, zone sukoba ili zdravstvene ustanove).

Procenjuje se da i do 70% ljudi tokom života doživi bar jedan ozbiljan traumatski događaj. Ove krize se često ispoljavaju u trenucima patnje sa kojom pojedinac nije u stanju da se nosi, kada se ljudi suočavaju sa značajnim emocionalnim previranjima, naglim životnim promenama ili ozbiljnim međuljudskim sukobima, što ih podstiče da potraže hitnu pomoć i podršku. Ipak, mnogi kojima je pomoć potrebna ne traže je, ponekad zbog straha od stigmatizacije ili nedostatka informacija, a mnogi je ne dobiju – najčešće zbog nedostatka dostupnih usluga. Dodatno, izdvajanja iz javnih zdravstvenih budžeta u mnogim zemljama nisu srazmerna razmerama ovog problema.

U hitnim službama, čak 20–30% pregleda vezanih za mentalno zdravlje odnosi se na akutne psihosocijalne krize. Ako se ne leče, problemi mentalnog zdravlja često dovode do dugoročnih posledica poput lošeg obrazovanja, nezaposlenosti, narušenih međuljudskih odnosa i lošeg fizičkog zdravlja.

Pored mentalnih bolesti, životni događaji poput gubitka voljenih osoba usled smrti, trauma (npr. nasilje, nesreće) ili velikih životnih promena (npr. razvod, gubitak posla), kao i prirodne katastrofe i ratovi, naglašavaju hitnu potrebu za ciljanom mentalnozdravstvenom intervencijom i sistemima podrške, neophodnim za rešavanje sve većih izazova sa kojima se ljudi suočavaju širom sveta. Zabrinjava rast broja mentalnozdravstvenih kriza, samopovređivanja i suicidalnih ideacija među mladima širom sveta, što je prema izveštaju Svetske zdravstvene organizacije (SZO) iz 2023. godine naročito izraženo nakon društvene izolacije, prekida obrazovanja i ekonomske nestabilnosti izazvanih pandemijom KOVID-19 oboljenja.

Trauma koja pogađa pojedince, porodice i zajednice često dovodi do psihosocijalnih kriza, koje predstavljaju odraz nestabilnosti i opasnih okolnosti. Promovisanje rezilijentnosti i blagostanja je od ključnog značaja za pomoć ljudima da se „povrate“ nakon suočavanja sa teškoćama. Sve veći broj međunarodnih studija razmatra koncept rezilijentnosti, sa fokusom na njegovu primenu u različitim oblastima, uključujući psihologiju, ekologiju i razvoj zajednice. Iako su ova istraživanja ostvarila značajan međunarodni značaj, koncept rezilijentnosti je i dalje relativno nedovoljno proučen u pojedinim kontekstima. Ovaj jaz pruža priliku istraživači-

INTRODUCTION

The frequency of psychosocial crises can significantly vary based on the definitions employed, the population under study (for instance, the general population compared to individuals with chronic illness or a history of trauma), and the context or environment (such as low-income areas, conflict zones, or healthcare settings).

It is estimated that as many as 70% of individuals will experience at least one serious traumatic event during their lifetime. These crises often manifest in moments of overwhelming distress, where individuals face significant emotional turmoil, sudden life changes, or severe interpersonal conflicts, prompting them to seek immediate care and support. However, many people who need help don't ask for it, sometimes due to stigma or lack of knowledge, and many do not receive it; often because services are lacking. Furthermore, a fraction of public health budgets in many countries doesn't match the scale of the crisis.

In emergency rooms, as many as 20–30% of visits related to mental health concerns arise from acute psychosocial crises. If not addressed, mental health problems often lead to long-term consequences in poor education, unemployment, poor relationships, physical health.

In addition to mental illness, life events like loss of loved ones due to death, trauma (e.g., violence, accidents), or major transitions can provoke mental breakdowns (e.g., divorce, job loss), and natural disasters and war emphasize the urgent need for targeted mental health interventions and support systems necessary to address these increasing challenges faced by people worldwide. The troubling fact is an increase in mental health crises, a rise in self-harm and suicidal ideation among youth worldwide, as per a 2023 World Health Organization (WHO) report, particularly in the aftermath of the COVID-19 pandemic-induced social isolation, disruptions to education, and economic instability.

Trauma affecting individuals, families, and communities often leads to psychosocial crises, which are a reflection of instability and dangerous situations. Promoting resilience and well-being is essential for helping people “bounce back” after facing difficulties. There is a growing body of international literature exploring the concept of resilience, focusing on its applications in various fields, including psychology, ecology, and community development. While these studies have gained significant traction globally, the concept of resilience is still relatively underexplored in some contexts. This gap presents an opportunity for researchers and practitioners in Serbia to incorporate resilience

ma i praktičarima u Srbiji da u lokalne prakse i politike uključe okvire rezilijentnosti, što bi moglo da unapredi odgovore na društvene, ekonomske i ekološke izazove.

MATERIJALI I METODE

Ovaj rad pruža narativni pregled koji detaljno razmatra osnovne definicije i koncepte povezane sa dinamikom, uzrocima i posledicama psihosocijalne krize, kao i rezilijentnost i blagostanje kao snažne alate u suočavanju sa izazovima psihosocijalne krize.

Sprovedena je ciljano usmerena pretraga referenci korišćenjem ključnih reči povezanih sa definicijama i konceptima ovog stanja (psihosocijalna kriza, kriza mentalnog zdravlja, psihološki distres, emocionalna kriza, akutni stres, mentalni poremećaji, intervencija u krizi), kao i sa različitim faktorima koji doprinose psihosocijalnoj krizi, njenim okidačima (trauma i nedaće) i izazovima.

Umesto na globalne izveštaje, ovaj pregled se prvenstveno fokusira na članke koji nude strategije zasnovane na dokazima za unapređenje otpornosti, duhovnosti i opšteg blagostanja na tri ključna nivoa: individualnom – gde se ističu lični mehanizmi suočavanja i sistemi psihološke podrške; porodičnom – gde se naglašava značaj negovanja međuljudskih odnosa i komunikacije; i društvenom – gde je fokus na mrežama socijalne podrške i resursima koji podstiču kolektivni osećaj sigurnosti i solidarnosti.

Najveći broj visokokvalitetnih kliničkih i multidisciplinarnih radova u časopisima sa recenzijom pronađen je u bazi *PubMed*, dok su članci, knjige i vodiči iz psihologije i psihijatrije pronađeni u bazi *PsycINFO*, kao i u segmentu društvenih nauka na *JSTOR*-u.

U narativnom pregledu je primenjena detaljnu deskriptivna analiza odabranih publikacija, počevši od sveobuhvatnog razmatranja ključnih komponenti psihosocijalnih kriza, a potom kroz isticanje efektivnih intervencija osmišljenih da podstaknu proaktivan pristup, sa krajnjim ciljem ublažavanja nepovoljnih posledica povezanih sa ovim krizama.

REZULTATI I DISKUSIJA

Psihosocijalna kriza predstavlja stanje nestabilnosti i povećanog rizika koje može uticati na pojedince, porodice i zajednice. To je izrazito stresno stanje, posebno kada se dogodi iznenada, sa malo ili bez prethodnog upozorenja. Takve krize mogu biti izazvane traumatskim događajima ili raznim životnim nedaćama.

Trauma se odnosi na izlaganje smrti ili opasnosti od smrti, teškoj povredi ili seksualnom nasilju, što se može dogoditi na jedan (ili više) od sledećih načina: direktnim doživljavanjem traumatskog događaja, prisustvovanjem događaju dok se dešava drugima, saznanjem da se takav događaj dogodio bliskom članu

frameworks into local practices and policies, which could enhance responses to social, economic, and environmental challenges.

MATERIALS AND METHODS

This article presents a narrative review that thoroughly examines the essential definitions and concepts related to the dynamics, causes, and consequences of psychosocial crisis, as well as resilience and well-being as powerful tools in dealing with challenges of psychosocial crisis.

A purposeful search for references was performed with keywords related to definitions and concepts of this condition (psychosocial crisis, mental health crisis, psychological distress, emotional crisis, acute stress, mental disorders, crisis intervention), and various factors that contribute to psychosocial crisis, its triggers (trauma and adversities), and challenges.

Additionally, rather than on global reports this review focuses on articles that provide evidence-based strategies to enhance resilience, spirituality and overall well-being across three critical levels: the individual level – wherein personal coping mechanisms and psychological support systems are highlighted; the family level – wherein the importance of nurturing relationships and communication is emphasized; and the community level – wherein focus is placed on social support networks and resources that foster a collective sense of security and solidarity.

The majority of high-quality peer-reviewed clinical and multidisciplinary studies were found on *PubMed*, while articles, books, and guidelines in psychology and psychiatry were found on *PsycINFO*, as well as in the social sciences segment on *JSTOR*.

The narrative review employed a detailed descriptive analysis of selected publications, beginning with an extensive exploration of the key components of psychosocial crises and continuing with highlights of effective interventions designed to foster proactive approaches, ultimately aiming to alleviate the adverse effects associated with these crises.

RESULTS AND DISCUSSION

A psychosocial crisis represents a state of instability and heightened risk that can affect individuals, families, and communities. It is a highly stressful condition, particularly when it occurs abruptly with little or no warning. Such crises may be triggered by traumatic events or by various adversities.

Trauma refers to exposure to actual or threatened death, serious injury, or sexual violence, which may occur one (or more) of the following ways: directly experiencing the traumatic event(s), witnessing the event(s)

porodice ili prijatelju, ili kroz izloženost događaju na nivou zajednice [1].

Trauma se odnosi na događaj koji je van okvira tipičnog ljudskog iskustva i koji duboko uznemirava gotovo svakoga. To je uznemirujuće iskustvo koje izaziva veliku dozu straha, osećanja nemoći, disocijacije, konfuzije ili drugih negativnih emocija koje su dovoljno intenzivne da ostavljaju dugotrajne negativne posledice na stavove, ponašanje i druge aspekte funkcionisanja pojedinca [2].

Traumatska iskustva utiču ne samo na pojedince, već i na porodice i čitave zajednice. Mogu proizaći iz događaja kao što su rat, iznenadni gubitak voljene osobe, silovanje, prirodne katastrofe i druge traumatične situacije. Trauma predstavlja ozbiljan globalni zdravstveni problem, gde milioni ljudi svake godine bivaju izloženi traumatičnim događajima i potom razvijaju povezane mentalne zdravstvene poremećaje, pre svega posttraumatski stresni poremećaj (PTSP). Procene pokazuju da oko 70% svetske populacije doživi bar jedan traumatski događaj tokom života, dok manji deo razvije PTSP; globalno, približno 3,9% ljudi je iskusilo PTSP u nekom trenutku svog života [3,4].

Nedaća predstavlja stanje ozbiljne ili dugotrajne traume ili nesreće, stanje patnje, bede ili nevolje koja traje. Obuhvata širok spektar negativnih iskustava – od ličnih poteškoća, poput bolesti ili ličnog gubitka, do šireg društvenog konteksta, poput siromaštva, rasizma ili diskriminacije. Nedaće mogu izazvati stres, emocionalnu patnju i negativne zdravstvene posledice. Međutim, one takođe mogu podstaći rezilijentnost, lični rast i razvoj i dublje razumevanje sopstvene ličnosti i sveta oko sebe [4,5].

Psihosocijalna kriza na nivou **pojedinca** utiče na emocionalno blagostanje, osećaj identiteta i osećaj sigurnosti. **Porodična kriza** se može opisati kao situacija u kojoj su odnosi toliko narušeni da mogu ugroziti samu porodicu. Na **nivou zajednice**, psihosocijalna kriza nastaje usled značajnih društvenih ili kulturnih promena koje dovode u pitanje postojeće vrednosti, norme i strukture, potencijalno dovodeći do široko rasprostranjene patnje, konflikata i društvene disfunkcije. Primeri uključuju brze društvene promene, kulturne konflikte, kao i ekonomsku i političku nestabilnost. Kriza može nastati nakon prirodne katastrofe, traumatskog događaja ili drugih nedaća, kao što su rat, genocid ili pandemije [5–7].

Rezilijentnost je sposobnost da se izdrži, odnosno „povrati“, od traume i nedaća, da se brzo oporavi i napreduje uprkos uobičajenim životnim fluktuacijama, stvarajući prilike za lični razvoj i rast [8,9].

Blagostanje podrazumeva pozitivno stanje bivstvovanja, uključujući mentalno zdravlje, životno zadovoljstvo, osvešćeni doživljaj životnog smisla, kao i sposobnost da se osoba nosi sa stresom. Na blagostanje utiču fizički, mentalni, emocionalni i društveni faktori [10].

as it happens to others, learning that such an event(s) has occurred to a close family member or friend, or experiencing it at the community level [1].

Trauma refers to an event outside the range of typical human experience that profoundly distresses nearly everyone. It is a disturbing experience that results in significant fear, helplessness, dissociation, confusion, or other disruptive feelings intense enough to have a long-lasting negative effect on a person's attitudes, behavior, and other aspects of functioning [2].

Traumatic experiences affect not only individuals but also families and entire communities. They may arise from events such as war, the sudden loss of a loved one, rape, natural disasters, and other traumatic situations. Trauma represents a major global health issue, with millions of people each year exposed to traumatic events and subsequently developing related mental health conditions, most notably post-traumatic stress disorder (PTSD). It is estimated that about 70% of the world's population will experience at least one traumatic event in their lifetime, while a smaller proportion develop PTSD; globally, approximately 3.9% of people have experienced PTSD at some point in their lives [3,4].

Adversity is a state of grave or lasting trauma or misfortune, a condition of suffering, destitution, or affliction that persists over time. It encompasses a wide range of negative experiences – from personal hardships, such as illness or loss, to broader societal issues, such as poverty, racism, or discrimination. Adversity can lead to stress, emotional distress, and negative health outcomes. However, it can also foster resilience, personal growth, and a deeper understanding of oneself and the world [4,5].

A **psychosocial crisis** at the **individual level** impacts a person's emotional well-being, sense of identity, and sense of safety. A **family crisis** can be described as a situation wherein relationships are strained to the point that they may ultimately break apart the family unit. At the **community level**, a psychosocial crisis emerges from significant social or cultural shifts that challenge existing values, norms, and structures, potentially resulting in widespread distress, conflict, and societal dysfunction. Some examples include rapid social change, cultural conflicts, and economic and political instability. It can occur following a natural disaster, traumatic event, or other adversities such as war, genocide, pandemics [5–7].

Resilience is the ability to withstand, i.e., “bounce back”, from trauma and adversity, recover quickly, and flourish despite the normal fluctuations that occur throughout life, creating opportunities for personal development and growth [8,9].

Well-being encompasses a positive state of being, including mental health, life satisfaction, sense

Okvir 1. Uobičajene posledice traume [11–13].

- Petnaest puta veći rizik od suicida
- Tri puta veći rizik od depresije i anksioznosti
- Četiri puta veći rizik od alkoholizma
- Fizički zdravstveni problemi, poput kardiovaskularnih bolesti i hroničnog bola
- PTSP, disocijativne tendencije
- Posledice po razvoj mozga (prefrontalni korteks, hipokampus i amigdala)
- Oštećeno kognitivno funkcionisanje
- Poremećaji socijalnih odnosa koji dovode do teškoća u uspostavljanju zdravih veza sa drugim ljudima i u ostvarivanju uspešnih međuljudskih interakcija

Glavni tipovi psihosocijalne krize

Psihosocijalne krize se mogu podeliti na nekoliko tipova i mogu biti izazvane određenim događajima ili dugotrajnim problemima na nivou pojedinca, porodice ili zajednice. Značajni životni događaji ili tranzicije koje zahtevaju prilagođavanje mogu poremetiti svakodnevne aktivnosti, uloge i odnose, često ugrožavajući fizičku bezbednost pojedinca ili porodice, kao i njihovo emocionalno i ekonomsko blagostanje [14]. Glavni tipovi psihosocijalne krize su sledeći:

Razvojna kriza: adolescencija, odlazak u penziju, rođenje deteta

Situaciona kriza: razvod, oboljevanje od mentalne ili fizičke bolesti, gubitak voljene osobe

Egzistencijalna kriza: unutrašnji konflikti izazvani egzistencijalnim pitanjima, poput straha od smrti, osećaja izolacije, preispitivanja smisla i svrhe života, osećaja slobode

Kriza nastala usled slučajnog događaja: Nastaje usled traumatskih, neočekivanih ili nasilnih događaja, kao i kriza izazvanih ljudskim delovanjem – rat, genocid, terorizam, prirodne katastrofe.

Duhovna kriza: preispitivanje vere, religijskih uverenja, duhovnih vrednosti

Kriza na nivou zajednice: nasilje u komšiluku, nedostatak resursa ili neadekvatna podrška zajednice

Finansijska kriza: Može se kretati od ličnog finansijskog neuspeha do šire ekonomske nestabilnosti u zajednici.

Individualna kriza prouzrokovana traumom i nedaćama

Krize na individualnom nivou obuhvataju širok spektar stresnih i uznemirujućih događaja koji mogu uticati na život i blagostanje pojedinca [6]. U njih spadaju:

of meaning and purpose, and the ability to manage stress. It is influenced by physical, mental, emotional, and societal factors [10].

Box 1. Common Consequences of Trauma [11–13].

- A fifteen times higher risk of suicide
- A three times higher risk of depression and anxiety
- A four times higher risk of alcoholism
- Physical health problems, such as cardiovascular disease and chronic pain
- PTSD, dissociative tendencies
- Impact on brain development (prefrontal cortex, hippocampus, and amygdala)
- Impaired cognitive functioning
- Disruption of social relationships leading to difficulties in forming healthy attachments and managing interpersonal interactions

Main types of psychosocial crisis

Psychosocial crises can be categorized into several types and may be triggered by specific events or long-term problems at the individual, family, or community level. Significant life events or transitions that require readjustment can disrupt daily activities, roles, and relationships, often threatening an individual's or family's physical safety, as well as their emotional and economic well-being [14]. The main types of psychosocial crisis include:

Maturation crisis: adolescence, retirement, becoming a parent

Situational crisis: divorce, developing mental or physical illness, loss of a loved one

Existential crisis: inner conflicts provoked by existential questions such as fear of death, isolation, the meaning and purpose of life, the sense of freedom

Adventitious crisis: resulting from traumatic, unexpected, or violent events and man-made crises – war, genocide, terrorism, natural disasters

Spiritual crisis: questioning one's faith, religious beliefs, spiritual values

Community crisis: neighbourhood violence, lack of resources, or inadequate community support

Financial crisis: These can range from a personal financial setback to broader economic instability in the community.

Individual crisis caused by trauma and adversities

Individual crises encompass a wide range of stressful and disruptive events that can impact an individual's life and well-being [6]. These include:

- Iznenadna smrt voljene osobe
- Teška bolest i mentalna zdravstvena kriza sa suicidalnim mislima
- Saobraćajne ili druge nesreće
- Emocionalna kriza: tuga, bes, strah, negativni unutrašnji dijalog
- Gubitak posla, iznenadno penzionisanje
- Neverstvo, prekid veze, rastava/razdvajanje, razvod
- Značajni finansijski gubici
- Prirodne katastrofe
- Svedočenje nasilju ili izloženost nasilju (biti žrtva nasilja), porodično nasilje
- Pljačka, hapšenje
- Kriza identiteta, načelno preispitivanje svojeg identiteta ili preispitivanje svog seksualnog identiteta
- Usamljenost, gubitak životnog smisla, suočavanje sa smrću

Porodična kriza izazvana traumom i nedaćama

Porodične krize obuhvataju širok spektar stresnih događaja koji remete porodični život i mogu opteretiti porodične odnose [15]. Oni uključuju:

- Smrt člana porodice, teška bolest člana porodice
- Gubitak posla
- Prirodne katastrofe
- Neverstvo, razvod
- Perinatalni problemi: neplanirana trudnoća, rođenje bebe, iznenadna smrt bebe ili majke, pobačaj
- „Sindrom praznog gnezda“ (odlazak dece od kuće)
- Usvajanje
- Penzionisanje
- Problemi sa mentalnim zdravljem
- Služenje zatvorske kazne
- Porodično nasilje
- Pljačka
- Istraga radi zaštite deteta od zlostavljanja i zanemarivanja

Krize zajednice kao sastavni deo širih društveno-kulturnih kriza

Krize zajednice često su deo šireg društveno-kulturnog konteksta. One nastaju kada jedna kultura ili društvo dožive značajne poremećaje ili previranja izazvana različitim faktorima ili događajima koji remete način života članova zajednice. Takve krize uključuju promene sistema vrednosti, uverenja i praksi koje definišu neku kulturu i društvo. Političke promene, ekonomska nestabilnost i diskriminacija su često osnovi ovih poremećaja, kao i drugi događaji koji utiču na pojedince, porodice i širu zajednicu [16]. Oni uključuju:

- Predrasude/diskriminacija po osnovu rase, roda, seksualne orijentacije ili vere

- Sudden death of a loved one
- Serious illness and mental health crisis with suicidality
- Car or other accidents
- Emotional crisis: sadness, anger, fear, negative self-talk
- Job loss, sudden retirement
- Infidelity, relationship breakups, separation, divorce
- Significant financial setbacks
- Natural disasters
- Witnessing or being the victim of violence, domestic violence
- Being robbed, being arrested
- Identity crisis, questioning general and sexual identity
- Loneliness, experiencing a loss of life purpose, facing death

Family crisis caused by trauma and adversities

Family crises encompass a wide range of stressful events that disrupt family life and can strain relationships [15]. These include:

- Death of a family member, serious illness of family members
- Job loss
- Natural disasters
- Infidelity, divorce
- Perinatal issues: unplanned pregnancy, newborn baby, sudden death of a baby or a mother, miscarriage
- “Empty nest syndrome” (children leaving home)
- Adoption
- Retirement
- Mental health issues
- Incarceration
- Domestic violence
- Robbery
- Child protection investigation

Community crisis as a part of a broader socio-cultural crisis

Community crises are often part of broader socio-cultural crises. Community crises occur when a culture or society undergoes significant upheaval or disruption caused by various factors or events that disrupt the way of life for its members. Such crises involve shifts in the values, beliefs, and practices that define a culture and society. Political changes, economic instability, and discrimination are often central to these disruptions, as are other events that impact individuals, families, and the wider community [16]. These include:

- Prejudice based on race, gender, sexual orientation, or religion
- Racism
- Patriarchal societal structures that marginalize women

- Rasizam
- Patrijarhalne društvene strukture koje marginalizuju žene
- Socijalna i ekonomska nejednakost, siromaštvo
- Radni sporovi i nemiri/štrajkovi
- Nejednakosti u pristupu obrazovanju
- Globalne zdravstvene krize, kao što je bila pandemija KOVID-19
- Krize izbeglica i raseljenih lica
- Politička nestabilnost i krize u vladama
- Oružani sukobi, uključujući rat i građanski rat

Pojedinci i nacije često glorifikuju rat, što odražava lični ili nacionalni narcizam. U savremenim oružanim sukobima, približno 90% žrtava čine civili, uključujući žene i decu.

Transgeneracijska i intergeneracijska trauma

Trauma se može prenositi kroz generacije, a neki nerazjašnjeni simptomi koji odražavaju ili pojačavaju psihosocijalne krize mogu biti povezani sa transgeneracijskom ili intergeneracijskom traumom.

- **Transgeneracijska trauma** odnosi se na traumu koja se prenosi sa jedne generacije na drugu, najčešće sa roditelja na decu. Kada roditelji pate od PTSP-a povezanog sa individualnom traumom (npr. seksualno zlostavljanje, nasilje u porodici, zatočeništvo, ratno zarobljeništvo) ili kolektivnom traumom (npr. rat, rasizam, ropstvo, kolonizacija, nasilje), njihova deca imaju povećan rizik od toga da obole od PTSP-a i depresije. Ovaj proces se često naziva sekundarna traumatizacija [17]. Primarna traumatizacija je snažno povezana sa ranim problemima u uspostavljanju bliskosti i predstavlja jedan od najvažnijih načina prenošenja traume. Uzrok leži u tome što rano uspostavljanje bliskosti u najvećoj meri zavisi od neverbalne komunikacije – tona glasa, izraza lica i govora tela – što sve može biti duboko narušeno kod osoba sa PTSP-om.
- **Intergeneracijska trauma** prevazilazi neposredni odnos roditelj–dete i može zahvatiti naredne generacije potomaka, ponekad i kroz tri do pet generacija. Velike društveno-kulturne traume, kao što su genocid, sistemski rasizam i rat, naročito su štetne kada utiču na biološke procese, kao što je metilacija DNK, čineći traumu prenosivom na buduće generacije [17,18].

Prenošenje traume usko je povezan sa epigenetskim promenama DNK izazvanim traumom. Ove promene ne menjaju sam genetski kod, već način na koji se geni ispoljavaju. Ključni mehanizam je metilacija DNK, odnosno, vezivanje metilnih grupa za DNK molekule, najčešće u oblasti promotora. Ovaj proces često

- Social and economic inequality, poverty
- Labor disputes and industrial unrest
- Disparities in access to education
- Global health crises, such as the COVID-19 pandemic
- Refugee and displacement crises
- Political instability and governance crises
- Armed conflict, including war and civil war

War is often glorified by individuals and nations, reflecting personal or national narcissism. In modern conflicts, approximately 90% of casualties are civilians, including women and children.

Transgenerational and intergenerational trauma

Trauma can be transmitted across generations, with some unexplained symptoms that reflect or intensify psychosocial crises being linked to transgenerational or intergenerational trauma.

- **Transgenerational trauma** refers to trauma passed on from one generation to the next, typically from parents to children. When parents suffer from PTSD related to individual trauma (e.g., sexual abuse, domestic violence, captivity, prisoners of war) or collective trauma (e.g., war, racism, slavery, colonization, violence), their children face an increased risk of developing PTSD and depression. This process is often referred to as secondary traumatization [17]. Primary traumatization is strongly associated with early attachment difficulties and represents one of the most powerful pathways for trauma transmission. This is because early attachment relies predominantly on nonverbal communication – tone of voice, facial expression, and body language – all of which can be profoundly affected by PTSD.
- **Intergenerational trauma** extends beyond the immediate parent–child relationship, affecting subsequent generations of descendants, sometimes across three to five generations. Large-scale socio-cultural traumas, such as genocide, systemic racism, and war, are especially harmful when they influence biological processes like DNA methylation, making the trauma transmissible to future generations [17,18].

The transmission of trauma is closely linked to trauma-induced epigenetic modifications of DNA. These modifications alter the way genes are expressed without changing the genetic code itself. One key mechanism is DNA methylation, the attachment of methyl groups to the DNA molecule, typically in promoter regions. This process often represses gene transcription, leading to functional changes in cellular activity. Thus, trauma-induced epigenetic alterations affect the ex-

potiskuje transkripciju gena, što dovodi do funkcionalnih promena u ćelijskoj aktivnosti. Na taj način, epigenetske promene izazvane traumom utiču na ekspresiju gena, ali ne i na samu strukturu gena [17–19].

Ne dolazi kod svih traumatizovanih pojedinaca do razvoja PTSP-a. Samo oko 7,8% onih koji su bili izloženi traumi razvije ovaj poremećaj. Ova varijacija može se objasniti zaštitnim epigenetskim obrascima, psihološkom rezilijentnošću ili snažnim kapacitetom za oporavak. U takvim slučajevima, potomci traumatizovanih osoba mogu biti zaštićeni od razvoja psiholoških simptoma. Takođe, deca mogu naslediti rezilijentnost, što im omogućava da ne budu pogođena traumom roditelja ili predaka [17,18].

Strategije suočavanja sa krizom

U lečenju traume i krize, od suštinskog je značaja pravo vreme prepoznati traumu i primeniti efikasne strategije za rešavanje psihosocijalnih kriza [20,21].

Strategije su sledeće:

- **Na individualnom nivou:** prepoznavanje i prihvatanje problema, identifikovanje ličnih potreba, primena tehnika za smanjenje stresa, traženje pomoći kada je potrebno i fleksibilnost u suočavanju sa promenama u okviru adaptivne strategije suočavanja sa problemima
- **Na porodičnom nivou:** održavanje otvorene i iskrene komunikacije među članovima porodice, pružanje međusobne emocionalne podrške i stvaranje sigurnog prostora za izražavanje osećanja
- **Na nivou zajednice:** građenje mreža podrške unutar zajednice, deljenje osnovnih resursa za preživljavanje (kao što su hrana i sklonište), međusobno slušanje, emocionalno povezivanje i pružanje podrške
Liderstvo i uzori su važni: Lider koji je miran i saosećajan u kriznom trenutku (npr. učitelj, medicinska sestra ili osoba od autoriteta) može predstavljati model rezilijentnosti i pomoći drugima da ostanu pribrani.
- **Na svim nivoima:**
 - Kulturni ili religijski običaji/prakse – rituali, molitva ili okupljanja zajednice (pa čak i virtuelna) pružaju kontinuitet, smisao i utehu u nestabilnim vremenima.
 - Smisao za humor i pozitivan stav – korišćenje humora (npr. pričanje šala i viceva) pri suočavanju sa stresom izazvanim krizom može da pomogne u preoblikovanju teških situacija i očuvanju emocionalne ravnoteže.
 - Volonterizam i altruizam – pomaganje drugima u krizi, kao što je deljenje pomoći ili briga o komšijama, podstiče osećaj svrhe i pripadnosti, što jača rezilijentnost.

pression of genes, rather than altering the genes themselves [17–19].

Not all traumatized individuals develop PTSD. Only about 7.8% of those exposed to trauma experience PTSD. This variation may be explained by protective epigenetic patterns, psychological resilience, or a strong capacity for recovery. In such cases, the offspring of traumatized individuals may be protected from developing psychological symptoms. Similarly, children may inherit resilience, allowing them to remain unaffected by parental or ancestral trauma [17,18].

Strategies in dealing with crises

In treating trauma and crisis, it is essential to recognize trauma early and apply effective strategies for managing psychosocial crises [20,21].

The strategies are:

- **At the individual level:** recognizing and acknowledging the problem, identifying personal needs, practicing stress-reduction techniques, seeking help when necessary, and using flexibility in the face of change as part of an adaptive coping strategy
- **At the family level:** maintaining open and honest communication with family members, providing mutual emotional support, and creating a safe space for expressing feelings
- **At the community level:** building community support networks, sharing essential resources (such as food and shelter), listening to one another, and remaining emotionally connected and supportive
Leadership and role models are important: a calm, compassionate leader in a crisis (e.g., a teacher, nurse, or elder) can model resilience and help others remain grounded.
- **At all levels:**
 - Cultural or religious practices – Rituals, prayer, or community gatherings (even virtual) provide continuity, meaning, and comfort during uncertain times.
 - Humor and positivity – Using humor (e.g., sharing jokes) to deal with stress during a crisis can help reframe difficult situations and maintain emotional balance.
 - Volunteerism and altruism – Helping others in a crisis, such as distributing aid or checking on neighbors, fosters purpose and belonging, which strengthens resilience.
 - Seeking mental health support – Proactively reaching out for counseling or therapy when feeling overwhelmed demonstrates resilience by recognizing the need for help and acting on it.

- Traženje stručne pomoći za očuvanje mentalnog zdravlja – proaktivno traženje savetovanja ili terapije u trenucima kada osećamo da se teško nosimo sa nedaćama pokazuje rezilijentnost kroz prepoznavanje potrebe za pomoći i delovanje u tom pravcu.
- Održavanje rutine i strukture – nastavak svakodnevnih rituala (kao što su vreme obroka, odlazak na treninge ili čitanje priča deci pred spavanje) pruža osećaj normalnosti tokom perioda haosa.
- Pronalaženje smisla u nevolji – osobe koje su preživele traumu i koje dele svoja iskustva sa drugima kako bi ih inspirisali ili edukovali često tom prilikom ostvaruju i sopstveni lični rast i razvoj, te doživljavaju osećaj ispunjenosti životne svrhe i isceljenja.
- Pronalaženje smisla u životu

Prema rečima Viktora E. Frankla:

„Kada više nismo u stanju da promenimo situaciju – izazvani smo da promenimo sebe.“

„Sve se može oduzeti čoveku osim jedne stvari: poslednje od ljudskih sloboda – da izabere svoj stav u bilo kojim okolnostima, da izabere svoj sopstveni put.“ [22].

Rezilijentnost i blagostanje

Kako bi ljudi mogli da se nose sa psihosocijalnim krizama i kako bi se sprečile trajne posledice traume, rezilijentnost i blagostanje treba da budu negovani kao bazične vrednosti. Uloga stručnjaka jeste da promovišu rezilijentnost i da pomažu u jačanju blagostanja kod pojedinaca i porodica koje se suočavaju sa psihosocijalnom krizom.

Rezilijentnost

Rezilijentnost je sposobnost da se osoba „povrati“ nakon suočavanja sa nedaćama. To je proces uspešnog prilagođavanja u situaciji kada smo izloženi nevoljama, traumi, tragediji, pretnji ili značajnim izvorima stresa – kao što su porodični i partnerski problemi, ozbiljni zdravstveni problemi, pritisci na radnom mestu ili finansijske poteškoće [23].

Kako je Konfučije mudro rekao:

„Naša najveća slava nije u tome da nikada ne padnemo, već da se svaki put kada padnemo, podignemo.“

Rezilijentna osoba može i dalje biti duboko pogođena traumom i iskusi psihološke simptome kao što su depresija, hipervigilnost ili intruzivna sećanja. Ipak, rezilijentnost joj omogućava da nastavi da funkcioniše u ključnim aspektima života, uprkos bolnim i uznemirujućim iskustvima. Rezilijentnost takođe podrazumeva sposobnost da se u nevolji doživi lični rast i razvoj, te pronade smisao u patnji. To je ona neuhvatljiva osobina koja nekim ljudima omogućava da, i kada ih trauma pogodi, iz nje izađu još jači.

- Maintaining routine and structure – Continuing with daily rituals (such as mealtimes, exercise, or bedtime stories for children) provides a sense of normalcy amid chaos.
- Creating meaning from adversity: Survivors of trauma who share their stories to inspire or educate others often experience a sense of growth, purpose, and healing.
- Finding meaning in life

In the words of Viktor E. Frankl:

“When we are no longer able to change a situation – we are challenged to change ourselves.”

“Everything can be taken from a man but one thing: the last of the human freedoms—to choose one’s attitude in any given set of circumstances, to choose one’s own way.” [22].

Resilience and well-being

In order to enable people to cope with psychosocial crises and prevent the lasting consequences of trauma, resilience and well-being should be cultivated as core values. The role of professionals is to foster resilience and help strengthen well-being in individuals and families confronted with psychosocial crises.

Resilience

Resilience is the ability to “bounce back” after encountering difficulty. It is the process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress – such as family and relationship problems, serious health conditions, workplace pressures, or financial hardship [23].

As Confucius wisely said:

“Our greatest glory is not in never falling, but in rising every time we fall.”

A resilient person may still be deeply affected by trauma and experience psychological symptoms such as depression, hypervigilance, or intrusive memories. However, resilience enables them to continue engaging in the essential aspects of life despite painful and distressing experiences. Resilience also involves the capacity to grow from adversity and find meaning in hardship. It is that ineffable quality that allows some people to be struck by trauma and return even stronger.

Resilience is not a fixed personality trait but rather a dynamic, learnable process. A key element of resilience is perspective – being able to place stressful events in a broader context and recognize their true severity, or sometimes their relative insignificance [9]. For resilient individuals, crises are not perceived as insurmountable obstacles but as challenges, learning experiences, and opportunities for personal growth.

Rezilijentnost nije fiksna crta ličnosti, već dinamičan proces koji se može naučiti. Ključni element rezilijentnosti je način sagledavanja situacije – sposobnost da se stresni događaji smeste u širi kontekst i da se prepozna njihova stvarna težina, ili pak njihova relativna beznačajnost [9]. Za rezilijentne pojedince, krize se ne doživljavaju kao nepremostive prepreke, već kao izazovi, prilike za učenje i lični razvoj.

Okvir 2. Rezilijentnost obuhvata:

- Kognitivnu i emocionalnu fleksibilnost
- Smisao za humor
- Samoeфикаsnost
- Pozitivno samopouzdanje
- Smisao i svrhu u životu
- Unutrašnje težište kontrole
- Negovanje duhovnih ili religijskih uverenja
- Sposobnost da se grade snažni međuljudski odnosi međusobne podrške

U svojoj studiji, Sautvik i Čarni su identifikovali deset mehanizama suočavanja sa nedaćama – nazvanih *faktorima rezilijentnosti* – koji su se pokazali kao efikasni u prevazilaženju stresa i traume. To su: optimizam, suočavanje sa sopstvenim strahom, jasno definisane moralne vrednosti, vera i duhovnost, socijalna podrška, rezilijentni uzori, fizička spremnost, očuvana „spremnost“ mozga, kognitivna i emocionalna fleksibilnost, te osvešćeni doživljaj životnog smisla [9].

Za mnoge učesnike u ovoj studiji, ovi faktori nisu bili samo korisni, već i spasonosni. Zanimljivo je da je rezilijentnost postala cenjena osobina i izvan kliničkih i kriznih okolnosti. Na primer, tokom razgovora za posao, rukovodioci često pridaju veći značaj nivou rezilijentnosti kandidata nego nivou obrazovanja ili čak radnom iskustvu, jer rezilijentnost pouzdanije predviđa dugoročni uspeh. Ovo pravilo važi podjednako u različitim kontekstima – od onkoloških bolničkih odeljenja, preko Olimpijskih igara, pa sve do odbora u korporacijama [24].

Rezilijentnost i duhovnost

Rezilijentnost predstavlja sposobnost da se prilagodimo, „povratimo“ ili čak napredujemo uprkos izazovima, stresu i teškoćama. To je univerzalno ljudsko iskustvo – svako se tokom života suočava sa poteškoćama i na neki način na njih reaguje.

Na isti način, i duhovnost je univerzalno ljudsko iskustvo. U najširem smislu, duhovnost se može razumeti kao traganje za smislom, svrhom, nečim svetim ili nečim što prevazilazi nas same. Ona nudi širu perspektivu i obuhvatniji pogled na naše postojanje. Duhovnost se može izražavati u sekularnim ili religijskim okvirima, ali i na načine potpuno nepovezane sa religijom.

Box 2. Resilience incorporates:

- Cognitive and emotional flexibility
- A sense of humor
- Self-efficacy
- Positive self-esteem
- Meaning and purpose in life
- An internal locus of control
- Nurturing spiritual or religious beliefs
- The capacity to build strong and supportive interpersonal relationships

In their study, Southwick and Charney identified ten coping mechanisms – referred to as *resilience factors* – that proved effective for managing stress and trauma. These include: optimism, facing fear, a moral compass, religion and spirituality, social support, resilient role models, physical fitness, brain fitness, cognitive and emotional flexibility, and meaning and purpose [9].

For many participants in their study, these ten factors were not only helpful but lifesaving. Interestingly, resilience has also become a valued quality beyond clinical and crisis contexts. For example, during job interviews, CEOs often place greater emphasis on a candidate's level of resilience than on their education or work experience, as resilience is a more accurate predictor of long-term success. This principle applies equally in diverse contexts – from cancer wards, to the Olympic Games, to corporate boardrooms [24].

Resilience and spirituality

Resilience is the capacity to adapt, “bounce back”, or even thrive in the face of challenges, stress, and adversity. It is a universal human experience – everyone encounters difficulties in life and responds to them in one way or another.

Similarly, spirituality is also a universal human experience. Broadly defined, spirituality can be understood as the search for meaning, purpose, something sacred, or something greater than ourselves. It offers perspective and a higher level from which to view our existence. Spirituality may be expressed in secular or religious terms, or in ways entirely unrelated to religion. According to modern psychology, spirituality is recognized as one of the 24 character strengths shared across humanity – transcending time, culture, nations, and belief systems [25]. Numerous studies demonstrate that spirituality contributes to well-being, supports healthy relationships, and enhances the sense of meaning in life [26,27].

For indigenous peoples, such as the Māori in New Zealand or the Aboriginal and Torres Strait Islander communities in Australia, spirituality provides a frame-

Prema savremenoj psihologiji, duhovnost je prepoznata kao jedna od 24 pozitivne karakterne osobine zajedničke čovečanstvu – bez obzira na vremenski period, kulturu, naciju i sistem verovanja [25]. Brojne studije pokazuju da duhovnost doprinosi blagostanju, podstiče zdrave odnose i jača osećaj smisla u životu [26,27].

Za autohtone narode, kao što su Maori na Novom Zelandu ili Aboridžini i narodi ostrva Toresovog more- uza u Australiji, duhovnost pruža okvir za razumevanje života, smrti i prirodnog sveta. Ona predstavlja izvor ukorenjenosti, nade i otpornosti u suočavanju s teškoćama [28–30].

Duhovna rezilijentnost se odnosi na sposobnost oslanjanja na unutrašnje vrednosti, kao što su uverenja, pozitivne osobine i vrednosti – uz istovremeno korišćenje spoljašnjih resursa kako bi se očuvao osećaj sopstvene ličnosti, smisla i svrhe prilikom suočavanja sa životnim izazovima i teškoćama [31]. Duhovna otpornost pomaže nam da obnovimo srce, um i duh, jačajući našu ljudskost iznutra, kroz verovanja oblikovana u teškim okolnostima, bez obzira na naše poreklo. Ona funkcioniše poput nevidljivog jedra koje nas održava stabilnim tokom mirnih i burnih perioda života i pomaže nam da povratimo ravnotežu kada posrnemo.

Duhovnost i rezilijentnost su međusobno povezane. Duhovnost deluje kao resurs koji pojedincima i porodicama omogućava da se nose s teškoćama, da očuvaju osećaj svrhe i smisla, i na taj način unaprede sposobnost da se suoče sa životnim izazovima i da očuvaju sopstveno blagostanje.

U svojoj suštini, duhovnost podstiče svesnost – ono što se opisuje kao „probuđena svesnost” – stanje u kojem je čovek otvoren za signale i usmerenja koje život nudi, umesto da se fokusira isključivo na sopstvene želje ili svoje očajanje.

Ljudi se rađaju sa kapacitetom za duhovnost. Istraživanja u oblasti neuronauke ukazuju na ulogu „probuđenog mozga”, koji obuhvata regije mozga poput fronto-temporalnog područja (vezivanje), ventralnog sistema pažnje (duhovna orijentacija) i parijetalnog režnja (smanjenje osećaja izolovanosti i podsticanje povezanosti sa drugima i sa širim smislom života) [32]. Studije funkcionalne magnetne rezonance pokazuju da je aktivnost u ventralnom fronto-temporalnom (VFT) području povezana sa ličnom duhovnošću [32].

Duhovna praksa obuhvata altruizam, ljubav prema drugima, dobrotu, zahvalnost, nadu i potragu za smislom života. Ona je povezana sa većom debljinom korteksa u VFT regionu mozga. Konceptualizovana kao „probuđeni mozak”, duhovnost ispoljava neuroprotektivni efekat na moždane oblasti koje učestvuju u rezilijentnosti. Kao takva, duhovnost predstavlja osnovni zaštitni faktor protiv stresa, PTSP-a, depresije, suicidalnosti i zavisnosti [33].

work for understanding life, death, and the natural world. It serves as a source of grounding, hope, and resilience in the face of hardship [28–30].

Spiritual resilience refers to the capacity to draw upon internal resources – such as beliefs, strengths, and values – while also engaging external resources to sustain a sense of self, meaning, and purpose when confronted with life's challenges and adversities [31]. Spiritual resilience helps us restore the heart, mind, and spirit, strengthening our humanity from within, through beliefs adopted in adverse circumstances, regardless of our background. Spiritual resilience functions like an invisible set of sails, keeping us steady during life's calms and storms, and helping us regain balance when we falter.

Spirituality and resilience are interconnected. Spirituality acts as a resource that enables individuals and families to navigate adversity and preserve a sense of purpose and meaning, ultimately enhancing their ability to cope with life's challenges and maintain a sense of well-being.

At its core, spirituality fosters awareness – what has been described as *“awakened awareness”* – a state wherein a person is receptive to life's signals and directions, rather than focusing solely on personal desires or despair.

Humans are born with a capacity for spirituality. Neuroscientific research highlights the role of the *“awakened brain,”* which involves brain regions such as the fronto-temporal brain (bonding), the ventral attention system (spiritual orientation), and the parietal lobe (reducing isolation and fostering connection to others and to a broader sense of life) [32]. Functional MRI studies show that activity in the ventral frontotemporal (VFT) region is associated with personal spirituality [32].

Spiritual practice encompasses altruism, love for others, kindness, gratitude, hope, and the search for meaning in life. It has been linked to greater cortical thickness in the VFT region of the brain. Conceptualized as the *“awakened brain,”* spirituality exerts a neuroprotective effect on brain areas involved in resilience. As such, spirituality represents a core protective factor against stress, PTSD, depression, suicidality, and addictions [33].

Family resilience

Healthy adaptation to stress depends not only on individuals, but also on the resources available through family, friends, and various organizations, as well as on the characteristics of specific cultures, religions, communities, societies, and governments – all of which may themselves be resilient to a greater or lesser degree.

Rezilijentnost porodice

Zdravo prilagođavanje na stres zavisi ne samo od pojedinaca, već i od resursa dostupnih kroz porodicu, prijatelje i različite organizacije, kao i od karakteristika određenih kultura, religija, zajednica, društava i vlada – koje i same mogu biti otpornije u manjoj ili većoj meri.

Glavni aspekti porodične rezilijentnosti jesu osobine i vrednosti njenih članova koje podstiču jedinstvo, saradnju, međusobnu empatiju i poštovanje. Porodična otpornost odražava sposobnost pozitivnog prilagođavanja kada se porodica suoči i sa očekivanjem i sa neočekivanim životnim događajima ili faktorima stresa.

U strategije prilagođavanja spadaju:

- Upravljanje stresom
- Emocionalna regulacija
- Traženje podrške
- Zajednički ciljevi
- Međusobno poštovanje individualnih razlika i potreba
- Roditeljska otpornost
- Poštovanje kulture
- Transcendencija vrednosti i duhovnost: Pronalaženje duhovne snage kroz duboku povezanost sa prirodom, muzikom ili umetnošću. Posmatrajući sebe kao deo nečega većeg od sebe, članovi porodice šire sagledavaju krizu kroz koju prolaze, što može podstaći dublji osećaj svrhe u njihovim životima.
- Porodični sistemi uverenja koji daju smisao krizi i izazovima: Krize se posmatraju kao zajednički izazovi. Teškoće se doživljavaju kao savladive i kao smisleno iskustvo koje doprinosi rastu i transformaciji tokom životnog ciklusa porodice.
- Negovanje pozitivnog stava prema životu: Porodice neguju optimizam, utvrđuju svoje pozitivne osobine i potencijal tokom kriza i jačaju pouzdanje, kao i duh vere u sopstvenu sposobnost („Mi to možemo“). Fokusiraju energiju na to da najbolje iskoriste dostupne mogućnosti istovremeno prepoznajući ono što je izvan njihove kontrole.
- Fleksibilnost: Porodice sa prilagodljivom strukturom mogu da se menjaju u skladu sa svojim potrebama i izazovima sa kojima se suočavaju, što im omogućava da se nose sa promenama nastalim usled krize ili nedaća. Snažno vođstvo koje obezbeđuje sigurnost i izvesnu meru predvidivosti pomaže ranjivim članovima da se lakše nose sa promenama.
- Povezanost: Članovi porodice treba da znaju da mogu da se oslone jedni na druge u kriznim vremenima. Istovremeno, otpornost porodice jača kada članovi poštuju individualnost, razlike i granice jedni drugih.
- Podrška iz socijalnih i ekonomskih resursa: Porodice se oslanjaju na mrežu rođaka, prijatelja, komšija i organizacija koje predstavljaju oslonac u teškim vremenima. Ova mreža pruža praktičnu pomoć, emoci-

The main aspects of family resilience are the qualities and values of its members that foster unity, collaboration, mutual empathy, and respect. Family resilience reflects the ability to adapt positively when faced with both expected and unexpected life events or stressors.

The adjustment strategies include:

- Stress management
- Emotional regulation
- Seeking support
- Collaborative goals
- Mutual respect for individual differences and needs
- Parental resilience
- Cultural respect
- Value transcendence and spirituality: Finding spiritual nourishment through a deep connection with nature, music, or art. By seeing themselves as part of something larger than themselves, family members gain a broader perspective on the crisis they are experiencing, which can foster a deeper sense of purpose in their lives.
- Family belief systems that create meaning from crisis and challenge: Crises are viewed as shared challenges. Adversity is perceived as manageable and meaningful, contributing to growth and transformation throughout the family life cycle.
- Maintaining a positive outlook: Families sustain optimism, affirm their strengths and potential during crises, and reinforce confidence and a “can-do” spirit. They focus energy on making the best of available options while also accepting what lies beyond their control.
- Flexibility: Families with adaptable structures can adjust to meet their needs and challenges, enabling them to cope with changes brought on by crises or adversity. Strong leadership with a focus on security and some sense of predictability helps guide vulnerable members through transitions.
- Connectedness: Family members must feel they can rely on one another in times of crisis. At the same time, resilience is strengthened when members respect each other’s individuality, differences, and boundaries.
- Support from social and economic resources: Families draw on networks of relatives, friends, neighbors, and organizations that provide lifelines during difficult times. These networks offer practical assistance, emotional support, and community connections. Resilient families recognize when they need help and actively make use of these resources.
- Clear and consistent family communication: Direct, specific, consistent, and honest communication helps all members understand the crisis, share feelings and opinions, and engage in collective de-

onalnu podršku i povezanost sa širom zajednicom. Otporne porodice prepoznaju kada im je potrebna pomoć i aktivno koriste dostupne resurse.

- Jasna i dosledna porodična komunikacija: Direktna, konkretna, dosledna i iskrena komunikacija pomaže članovima porodice da razumeju krizu, razmene osećanja i stavove i učestvuju u zajedničkom donošenju odluka o tome kako će porodica nastaviti dalje.
- Otvoreno izražavanje emocija: Porodice neguju međusobno poverenje, podstiču članove da podeli širok spektar osećanja, pokazuju empatiju i međusobno pružaju utehu. Takođe neguju humor i pozitivne interakcije, koje mogu da pruže predah od stresa tokom stresnih perioda.
- Zajedničko rešavanje problema: Članovi porodice identifikuju izazove, razmatraju dostupne opcije i donose odluke zajedno. Mišljenja svih članova se poštuju i vrednuju, uz naglasak na realne ciljeve i konkretne korake. Porodice grade samopouzdanje kroz uspehe, uče iz neuspeha i razvijaju proaktivne veštine za suočavanje sa budućim izazovima [34–37].

Rezilijentnost zajednice

Rezilijentnost neke zajednice odnosi se na njenu sposobnost da podnese, prilagodi se i oporavi od poremećaja u društvu, bilo da su izazvani prirodnim katastrofama, ekonomskim krizama ili drugim problemima. Ona obuhvata sposobnost zajednice da se pripremi, odgovori i „povrati“ nakon teškoća, na taj način naglašavajući kako fizičko tako i socijalno blagostanje zajednice. Rezilijentne zajednice mogu da ublaže štetu i ljudske gubitke nastale usled prirodnih katastrofa i drugih kriza.

Jačanjem svoje rezilijentnosti, zajednice postaju bolje pripremljene da se suoče sa dugoročnim izazovima poput klimatskih promena i ekonomske nestabilnosti. Inicijative koje podstiču otpornost podstiču saradnju, poverenje i osećaj zajedničke odgovornosti među stanovnicima. Takve zajednice su sposobnije da odgovore na potrebe svojih članova i da stvore zdraviju i dinamičniju sredinu.

Otpornost zajednice zavisi od kapaciteta društva, pojedinaca i porodica da opstanu, jer upravo oni moraju podržati zajednicu u ponovnom uspostavljanju ravnoteže tokom teškoća. Na isti način, samo snažna i otporna zajednica ima moć da povrati ravnotežu pojedinca, porodice i društva u celini. Izgradnja rezilijentnih zajednica zahteva razvoj u sledećim oblastima [38]:

- Uspostavljanje sigurne baze uz uvažavanje jednakosti i različitosti ljudi
- Podsticanje socijalnih kompetencija
- Jačanje odgovarajućih usluga koje odgovaraju potrebama ljudi
- Obezbeđivanje povezanosti među ljudima i organizacijama

cision-making about how the family will move forward in the face of crisis.

- Open emotional expression: Families nurture mutual trust, encourage one another to share a wide range of feelings, and practice empathy and mutual comfort. They also enjoy humor and positive interactions, which can serve as relief during stressful and challenging periods.
- Collaborative problem-solving: Family members identify challenges, explore available options for dealing with them, and make decisions together, as a team. They discover new possibilities for overcoming diversity, with the contributions of all family members being equally respected and valued. Emphasis is on realistic goals and concrete steps to achieve them. Families build on their success as they pursue their goals, they learn from setbacks, and develop proactive skills for managing future challenges [34–37].

Community resilience

Community resilience refers to a community's capacity to endure, adapt to, and recover from disruptions, whether caused by natural disasters, economic downturns, or other challenges. It involves the ability to prepare for, respond to, and “bounce back” from adversity, emphasizing both the physical and social well-being of the community. Resilient communities can minimize damage and loss of life resulting from natural disasters and other crises.

By building resilience, communities can better adapt to long-term challenges such as climate change and economic instability. Community resilience initiatives can foster collaboration, trust, and a shared sense of responsibility among residents. Resilient communities are better equipped to meet the needs of their members and to create a healthier, more vibrant environment.

Community resilience depends on the survival capacities of society, individuals, and families, as these elements must support the community in restoring balance during times of adversity. Likewise, only a strong and resilient community can help restore the equilibrium of individuals, families, and society as a whole. Building resilient communities requires development in the following areas [38]:

- Establishing a secure base and valuing equality and diversity
- Fostering social competence
- Strengthening appropriate services to meet people's needs
- Ensuring connectedness among people and organizations

- Promovisanje zdravog liderstva zasnovanog na moralnim vrednostima i odgovornosti prema potreba zajednice
- Podrška kulturnoj koheziji i kulturnoj toleranciji
- Negovanje pozitivnih i moralnih vrednosti
- Rad na prevenciji sukoba i pripremljenosti na teškoće
- Snažna podrška porodičnim vrednostima, jačanje povezanosti, kao i negovanje ljubavi i brige za decu i njihovu bezbednost.

Posebno je značajno za starosedeoce (tzv. prve narode) da budu izrazito otporni. Na primer, na Novom Zelandu, kultura Maora stavlja akcenat na odnose među ljudima, kao i na veze sa predacima i prirodnim svetom, koje su utemeljene na vrednostima kao što su: *whanaungatanga* (srodstvo), *manaakitanga* (briga) i *kaitiakitanga* (domaćinsko staranje). Ovaj kolektivistički pogled na svet podstiče snažne veze u zajednici, duboku povezanost sa zemljom i široko shvatanje vremena koje povezuje prošlost, sadašnjost i budućnost u donošenju odluka i kulturnim praksama, kao što su *haka*, *tangihanga* (sahrane) i očuvanje znanja predaka (*mātauranga*). Za razliku od individualističkih zapadnih kultura, kultura Maora stavlja zajednicu i kolektivno blagostanje iznad potreba pojedinca [28,29].

Aboridžini i narodi ostrva Toresovog moreza u Australiji suočili su se sa dubokim i trajnim teškoćama zbog istorijskih i kontinuiranih posledica kolonizacije, uključujući društvena, politička, ekonomska i kulturna ograničenja, kao i strukturni rasizam. Njihova rezilijentnost je duboko ukorenjena u kulturi, uz zaštitne faktore kao što su snažne veze sa zemljom, srodničke veze, duhovnost, kulturni rituali i prakse. Ovi elementi podstiču kolektivni identitet i samoopredeljenje, podržavajući kulturnu revitalizaciju i opšte blagostanje [30,39].

Blagostanje i psihosocijalna kriza

Blagostanje predstavlja stanje napretka koje obuhvata različite aspekte života i ima ključnu ulogu u ukupnom zdravlju, sreći i uspehu.

Blagostanje se ogleda u proživljavanju pozitivnog i ispunjenog života. To nije samo odsustvo patnje, već i prisustvo pozitivnih iskustava, ispunjenosti i osećaja smisla. Blagostanje je snažno povezano i sa fizičkim i sa mentalnim zdravljem. Ona doprinosi većem životnom zadovoljstvu, jača otpornost i povećava sposobnost suočavanja sa stresom i krizama. Osim toga, podstiče produktivnost i uspešnost.

PERMA model [40] identifikuje pet osnovnih elemenata dobrobiti: pozitivne emocije, angažovanost, međuljudske odnose, ostvarivanje smisla i postignuće. Fokusiranje na ove oblasti podstiče ravnotežu i ispunjenost, čime se uvećavaju blagostanje i životno zadovoljstvo.

- Promoting healthy leadership rooted in moral values and responsiveness to community needs
- Supporting cultural cohesion and cultural tolerance
- Nurturing positive and moral values
- Working on conflict prevention and preparing for adversity
- Maintaining strong support for family values, strengthening bonds, and cultivating a loving and caring attitude toward children and their safety.

It is particularly significant that Indigenous/First Nations/peoples demonstrate high resilience. For example, in New Zealand, Māori culture emphasizes reliance on relationships among people, ancestors, and the natural world, grounded in values such as *whanaungatanga* (kinship), *manaakitanga* (care), and *kaitiakitanga* (stewardship). This collectivist worldview fosters strong community bonds, deep connections to the land, and a broad sense of time that integrates past, present, and future in decision-making and cultural practices such as *haka*, *tangihanga* (funerals), and the preservation of ancestral knowledge (*mātauranga*). In contrast to individualistic Western cultures, Māori culture places community and collective well-being above individual needs [28,29].

Aboriginal and Torres Strait Islander peoples in Australia have endured profound and persistent adversity due to the historical and ongoing impacts of colonization, including social, political, economic, and cultural constraints, as well as structural racism. Their resilience is deeply rooted in culture, with protective factors such as strong connections to the land, kinship systems, spirituality, and cultural rituals and practices. These elements foster collective identity and self-determination, supporting cultural revitalization and overall well-being [30,39].

Well-being and psychosocial crisis

Well-being is a state of thriving that encompasses various aspects of life and plays a vital role in overall health, happiness, and success.

Well-being is reflected in experiencing a positive, fulfilling life. It is not merely the absence of suffering, but the presence of positive experiences, fulfillment, and a sense of meaning. Well-being is strongly associated with both physical and mental health outcomes. It contributes to greater life satisfaction, strengthens resilience, and enhances the ability to cope with stress and crises. In addition, it supports productivity and performance.

The PERMA model [40] identifies five core elements of well-being: positive emotions, engagement, relationships, meaning, and accomplishment. Focusing on these areas fosters balance and fulfillment, ultimately enhancing resilience and life satisfaction.

Primena principa PERMA modela podstiče lični rast i razvoj i unapređuje mentalno zdravlje, postavljajući temelje za trajnu sreću, smislen i ispunjen život.

Faktori koji utiču na blagostanje

- Lični faktori: samopoštovanje, delotvorne veštine u rešavanju životnih situacija i osećaj kontrole nad sopstvenim životom
 - Socijalni faktori: snažni međuljudski odnosi, podržavajuća zajednica i osećaj pripadnosti
 - Faktori sredine: bezbedno i zdravo okruženje sa pristupom resursima i mogućnostima za rast i razvoj
 - Ekonomski faktori: finansijska stabilnost, sigurno zaposlenje i pravičan pristup resursima
- Psihosocijalne krize mogu duboko da utiču na blagostanje pojedinaca i porodica. Jačanje rezilijentnosti na nivou pojedinca, porodice i društva predstavlja ključnu komponentu u unapređivanju sveukupnog blagostanja [41]. Blagostanje se može unaprediti putem sledećih načina:
- Davanje prednosti samonezi: bavljenje aktivnostima koje podstiču opuštanje, uživanje i smanjenje stresa
 - Izgradnja čvrstih međuljudskih odnosa: negovanje veza sa porodicom, prijateljima i članovima zajednice
 - Zahvalnost za ono što imamo i pozitivan stav: usredsređenost na pozitivne aspekte života i negovanje optimističnog pogleda na svet
 - Učešće u smislenim aktivnostima: bavljenje poduhvatima koji pružaju radost, smisao i osećaj postignuća
 - Traženje stručne pomoći kada je potrebna
 - Učenje novih životnih veština
 - Razumevanje prema sebi samom i drugima
 - Prisutnost u sadašnjem trenutku
 - Fokusiranje na vrline umesto na slabosti
 - Podrška zajednici kroz altruizam

ZAKLJUČAK

Psihosocijalna kriza, kao posledica traume i nedaća, može biti ozbiljno stanje koje pogađa pojedince, porodice i zajednice. Praktikovanje rezilijentnosti, negovanje duhovnosti i jačanje blagostanja jesu dragocene strategije, ne samo za prevazilaženje psihosocijalne krize, već i za pripremu pojedinaca, porodica i zajednica za buduće izazove proizišle iz traume i nedaća.

Osnaživanje rezilijentnosti treba da bude jedan od ključnih ciljeva stručnjaka koji rade sa osobama suočenim sa različitim psihosocijalnim krizama. Podjednako je važno da stručnjaci prepoznaju ove krize i kao priliku za lični, porodični i društveni rast i razvoj.

Sukob interesa: Nije prijavljen.

Applying PERMA principles promotes personal growth and improved mental health, laying the foundation for lasting happiness and a meaningful and fulfilling life.

Factors influencing well-being

- Personal factors: self-esteem, effective coping skills, and a sense of control over one's life
 - Social factors: strong relationships, a supportive community, and a sense of belonging
 - Environmental factors: a safe, healthy environment with access to resources and opportunities for growth
 - Economic factors: financial stability, secure employment, and equitable access to resources
- Psychosocial crises can profoundly affect the well-being of individuals and families. Strengthening resilience at the individual, family, and societal levels is a key component of enhancing overall well-being [41]. Well-being can be improved through:
- Prioritizing self-care: engaging in activities that promote relaxation, enjoyment, and stress reduction
 - Building strong relationships: nurturing connections with family, friends, and community members
 - Practicing gratitude and positivity: focusing on life's positive aspects and cultivating an optimistic outlook
 - Engaging in meaningful activities: participating in pursuits that provide joy, purpose, and a sense of accomplishment
 - Seeking professional help when needed
 - Learning new life skills
 - Showing kindness toward oneself and others
 - Being present in the "here and now"
 - Focusing on strengths rather than weaknesses
 - Supporting the community through altruism

CONCLUSION

Psychosocial crisis, as a consequence of trauma and adversity, can be a serious condition that impacts individuals, families, and communities. Practicing resilience, nurturing spirituality, and strengthening well-being are valuable strategies not only for overcoming a psychosocial crisis but also for preparing individuals, families, and communities to face future challenges arising from trauma and adversity.

Empowering resilience should be a central goal for professionals working with people experiencing different psychosocial crises. Equally important is that professionals recognize these crises as opportunities for personal, family, and community growth and development.

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LITERATURA / REFERENCES

- American Psychiatric Association, ed. (2022). *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR)*. Washington, DC, USA: American Psychiatric Publishing.
- APA Dictionary of Psychology, Second edition (2015). American Psychological Association, Washington, DC. USA.
- Benjet C, Bromet E, Karam EG, Kessler RC, McLaughlin KA, Ruscio AM, et al. The epidemiology of traumatic event exposure worldwide: results from the World Mental Health Survey Consortium. *Psychol Med*. 2016 Jan;46(2):327-43. doi: 10.1017/S0033291715001981.
- Roy C. Adversity and theory: the broad picture. *Nurs Sci Q*. 2008 Apr;21(2):138-9. doi: 10.1177/0894318408316407.
- Chandra N. Adversity Quotient: Surviving Rather Than Giving Up. *Psychology and Education Journal*. 2021; 58(2):5942-7.
- Zahrai L. Individual Crisis: The dynamics of the basic experiences. *Journal of Vasyi Stefanyk Precarpathian National University*. 2021;8 (2):100-7.
- Nigg C, Petersen E, MacIntyre T. Natural environments, psychosocial health, and health behaviors in a crisis - A scoping review of the literature in the COVID-19 context. *J Environ Psychol*. 2023 Jun;88:102009. doi: 10.1016/j.jenvp.2023.102009.
- Thongworn S. Family Resilience: A Concept for Coping with Family. *Thai Journal of Public Health*. 2023; Vol. 53 No.2.
- Southwick S, Charney. *Resilience, the Second edition*. 2021 Cambridge University Press. U.K.
- Aron J, Roache A. What Is Wellbeing? *International Journal of Environmental Research and Public Health*. 2023; 20(6):5006.
- Olf M, Hein I, Amstadter AB, Armour C, Skogbrott Birkeland M, Bui E, et al. The impact of trauma and how to intervene: a narrative review of psychotraumatology over the past 15 years. *Eur J Psychotraumatol*. 2025 Dec;16(1):2458406. doi: 10.1080/20008066.2025.2458406.
- Karchoud JF, Haagsma J, Karaban I, Hoeboer C, van de Schoot R, Olf M, et al. Long-term PTSD prevalence and associated adverse psychological, functional, and economic outcomes: a 12-15 year follow-up of adults with suspected serious injury. *Eur J Psychotraumatol*. 2024;15(1):2401285. doi: 10.1080/20008066.2024.2401285.
- Koenen KC, Ratanatharathorn A, Ng L, McLaughlin KA, Bromet EJ, Stein DJ, et al. Posttraumatic stress disorder in the World Mental Health Surveys. *Psychol Med*. 2017 Oct;47(13):2260-2274. doi: 10.1017/S0033291717000708.
- Kendra C. What is a crisis: Different types of crises. *Verywellmind*, September 23, 2023.
- Bates D. *Family crisis. Guidebook*. Longform Publishing. 2018.
- Alexander J. *What Makes a Social Crisis? The Socialization of Social Problems*. Cambridge, Polity Press. 2019.
- Marčinko D i saradnici. *Transgeneracijska trauma*. Medicinska naklada, Zagreb. 2023.
- Wolyn M. *It did not start with you*. Penguin Pub. USA, 2017.
- Yehuda R, Daskalakis NP, Bierer LM, Bader HN, Klengel T, Holsboer F, et al. Holocaust Exposure Induced Intergenerational Effects on FKBP5 Methylation. *Biol Psychiatry*. 2016 Sep 1;80(5):372-80. doi: 10.1016/j.biopsych.2015.08.005.
- Dückers ML. Multilayered psychosocial resilience framework and its implications for community-focused crisis management *Journal of Contingencies and Crisis Management*: 2017; 25(3), 182-7.
- Kaniasty K, Norris F. H. Social support in the aftermath of disasters, catastrophes, and acts of terrorism: Altruistic, overwhelmed, uncertain, antagonistic, and patriotic communities. In: R. Ursano, A. Norwood, & C. Fullerton (Eds.). 2004 *Bioterrorism: Psychological and public health interventions* (pp. 200-229). Cambridge, UK: Cambridge University Press.
- Frankl V. *The Power of Choice*. In: *Man's Search for Ultimate Meaning*. Basic Books. 2000.
- American Psychological Association. *The Road to Resilience*. American Psychological Association, Washington DC. 2010.
- Coutu DL. How resilience works. *Harv Bus Rev*. 2002 May;80(5):46-50, 52, 55 passim.
- Manning L, Ferris M, Rosario CN, Prues M, Bouchard L. Spiritual resilience: Understanding the protection and promotion of well-being in the later life. *J Relig Spiritual Aging*. 2019;31(2):168-186. doi: 10.1080/15528030.2018.1532859.
- Niemiec T. Six Functions of Character Strengths for Thriving at Times of Adversity and Opportunity: a Theoretical Perspective. *Springer Nature*. 2020;15(551-72).
- Niemiec RM, Russo-Netzer P, Pargament KI. The decoding of the human spirit: A synergy of spirituality and character strengths toward wholeness. *Frontiers in Psychology*. 2020; 11, 2040.
- Boston MB, Flinloft EJ, Bertram D. Integrating Maori Perspectives into Community Resilience Frameworks for the Built Environment. *NZSEE 2022 Annual Conference*.
- Elder H. *Aroha: Maori wisdom for contented life lived in harmony with our planet*. 2020. Ebury Press, New Zealand.
- Usher K, Jackson D, Walker R, Durkin J, Smallwood R, Robinson M, et al. Indigenous Resilience in Australia: A Scoping Review Using a Reflective Decolonizing Collective Dialogue. *Front Public Health*. 2021 Mar 31;9:630601. doi: 10.3389/fpubh.2021.630601.
- Howard AH, Roberts M, Mitchell T, Wilke NG. The Relationship Between Spirituality and Resilience and Well-being: a Study of 529 Care Leavers from 11 Nations. *Advers Resil Sci*. 2023;4(2):177-190. doi: 10.1007/s42844-023-00088-y.
- Tomasulo Spirituality and Neuroprotective Benefits for Resilience. *Resilience Webinar, Medical Academy, Australia*. 2025.
- Cook CC, White NH (2018). Resilience and the role of spirituality. In D. Bhugra K, Bhui S, Yeung S, Wong S, Gilman (Eds.), *Oxford textbook of public mental health*. Oxford University Press. 2018; (513-520).
- Southwick SM, Litz B, Charney DS, Friedman MJ. (eds). *Resilience and Mental Health: Challenge Across the Lifespan*. Cambridge. Cambridge University Press. 2011.
- Walsh F. *Strengthening Family Resilience (Second Edition)*. New York: The Guilford Press. 2006.
- Walsh F. A family resilience framework: Innovative practice applications. *Family relations*. 2002;51(2):130-8.
- Henry CS, Harrist AW. *Family Resilience Theory. Sourcebook of Family Theories and Methodologies*. Cham: Springer International Publishing. 2022. 65-91.
- Graeber D, Wengrow D. *The Dawn of Everything: A New History of Humanity*. New York: Penguin. Books. 2021.
- Morgan M. *Mutant Message Down Under*. Harper Collins Publisher. 1994.
- Seligman M. PERMA and the building blocks of well-being. *Journal of Positive Psychology*. 2018;13(4), 333-5.
- Alexandrova AA. *Philosophy for the Science of Well-Being*. Oxford University Press: Oxford, UK. 2017.

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MOGUĆNOSTI KORIŠĆENJA SENZORA INERCIJALNE MERNE JEDINICE ZA PROCENU SPOSOBNOSTI ODRŽAVANJA RAVNOTEŽE KOD STARIJIH OSOBA

ORIGINALNI RAD

ORIGINAL ARTICLE

POSSIBILITIES OF USING INERTIAL MEASUREMENT UNIT SENSOR FOR ASSESSING BALANCE ABILITIES IN THE ELDERLY

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SAŽETAK

Cilj rada: Ova studija imala je za cilj da proceni promene u posturalnoj stabilnosti kod zdravih starijih osoba korišćenjem senzora inercijalne merne jedinice (IMU) i da ispita klinički potencijal prenosive tehnologije za procenu ravnoteže u gerijatrijskoj populaciji.

Metode: Trideset četiri zdrava ispitanika starija od 65 godina podeljena su u dve starosne grupe (65–75 i > 75 godina). Ravnoteža je procenjena korišćenjem IMU senzora postavljenog na sakrum tokom 30-sekundnog stajanja u polu-tandem stavu u tri pokušaja.

Rezultati: Učesnici stariji od 75 godina pokazali su povećane oscilacije tela u odnosu na mlađu grupu. Polne razlike su otkrile veće medio-lateralne oscilacije kod muškaraca ($p = 0,038$). Nisu uočene značajne razlike u brzini oscilacija ili površini elipse, što ukazuje na efikasne kompenzatorne mehanizme u statičkim uslovima.

Zaključak: IMU-bazirana procena ravnoteže pokazuje osetljivost u otkrivanju suptilnih promena povezanih sa starošću, sa praktičnim prednostima za klinička i zajednička okruženja.

Ključne reči: posturalna stabilnost, starenje, prevencija padova, prenosiva tehnologija, procena ravnoteže

ABSTRACT

Aim: This study aimed to evaluate age-related changes in postural stability among healthy older adults using inertial measurement unit (IMU) sensors and assess the clinical potential of wearable technology for balance assessment in geriatric populations.

Methods: Thirty-four healthy participants aged > 65 years were divided into two age groups (65–75 and > 75 years). Balance was assessed using a sacrum-mounted IMU sensor during a 30-second semi-tandem stance in three trials.

Results: Participants > 75 years showed increased postural sway compared to younger counterparts. Gender differences revealed greater medio-lateral sway in males ($p = 0.038$). No significant differences were observed in sway velocity or ellipse area, suggesting effective compensatory mechanisms in static conditions.

Conclusion: IMU-based balance assessment demonstrates sensitivity in detecting subtle age-related postural changes, with practical advantages for both clinical and community settings.

Keywords: postural stability, aging, fall prevention, wearable technology, balance assessment

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UVOD

Ravnoteža je osnovna komponenta ljudskog kretanja. Funkcija ravnoteže održava se pomoću specifičnih fizioloških mehanizama koji regulišu posturalnu stabilnost kroz preciznu prostorno-vremensku kontrolu centra mase (COM) u odnosu na bazu oslonca [1]. Ovo zahteva kontinuiranu integraciju više senzornih ulaza, uključujući gravitacione signale, karakteristike podloge, vizuelne informacije i proprioceptivne povratne informacije, kako bi se postigla optimalna orijentacija tela [2].

Održavanje ravnoteže tokom antigravitacionih aktivnosti i pravilnog držanja tela predstavlja osnovu za izvođenje složenijih pokreta. Ovi sekundarni pokreti omogućavaju nam da se krećemo kroz prostor ili da stupamo u interakciju sa okruženjem [3]. Ravnoteža i hod imaju ključnu ulogu u očuvanju opšte dobrobiti i nezavisnosti starijih osoba.

Nažalost, starije osobe suočavaju se sa povećanim rizikom od padova zbog fizioloških promena povezanih sa starenjem – uključujući usporene reakcije ravnoteže, senzorne deficite, efekte lekova i neuromišićnu degeneraciju, što narušava složenu senzorimotornu koordinaciju koja je osnova posturalne kontrole [4].

Poteškoće u ovim oblastima ne samo da povećavaju rizik od padova i povreda, već doprinose i smanjenoj pokretljivosti i socijalnoj izolaciji. Studije pokazuju da približno 13% osoba uzrasta od 65 do 69 godina prijavljuje probleme sa ravnotežom, dok se taj procenat naglo povećava na 46% kod osoba starijih od 85 godina. Slično tome, poremećaji hoda predstavljaju čest problem, pogađajući oko 35% starijih od 70 godina koji nisu institucionalizovani. Ovi poremećaji nisu povezani samo sa smanjenom pokretljivošću, već i sa 2,2 puta većim rizikom od institucionalizacije i smrtnosti u poređenju sa osobama bez poremećaja hoda [5]. Ove statistike naglašavaju hitnu potrebu za ranom identifikacijom, preventivnim strategijama i prilagođenim intervencijama kako bi se očuvala pokretljivost i smanjili zdravstveni rizici u starijoj populaciji. Imajući u vidu ozbiljne posledice padova kod starijih osoba, procena poremećaja ravnoteže predstavlja standardnu i ključnu praksu u gerijatrijskoj nezi i rehabilitaciji. Rano otkrivanje i intervencija mogu značajno smanjiti rizik od padova, očuvati nezavisnost i poboljšati kvalitet života.

Klinički alati kao što su Bergova skala ravnoteže, Timed Up and Go (TUG) test, Functional Reach test i Tinetti test široko se koriste zbog svoje efikasnosti, pouzdanosti i mogućnosti da pruže vredne uvide u rizik od padova. Međutim, ovi testovi se u velikoj meri oslanjaju na subjektivnu procenu ispitivača, što može ugroziti njihovu tačnost i doslednost. Takođe, često nemaju dovoljnu osetljivost da razlikuju osobe u relativno zdravoj

INTRODUCTION

Balance is a fundamental component of human movement. The function of balance is maintained by specific physiological mechanisms that regulate postural stability through precise spatiotemporal regulation of the center of mass (COM) relative to the base of support [1]. This requires the continuous integration of multiple sensory inputs, including gravitational cues, support surface characteristics, visual information, and proprioceptive feedback, to achieve optimal body orientation [2].

Maintaining balance during anti-gravitational activities and sustaining proper posture form the foundation for executing more complex movements. These secondary movements enable us to propel ourselves through space or interact with our surrounding environment [3]. Balance and gait play a vital role in maintaining the overall well-being and independence of elderly individuals.

Unfortunately, older adults face an increased risk of falls due to age-related physiological changes - spanning slowed balance reactions, sensory deficits, medication effects, and neuromuscular deterioration, which disrupt the complex sensorimotor coordination underlying postural control [4].

Difficulties in these areas not only increase the risk of falls and injuries but also contribute to reduced mobility and social isolation. Studies show that approximately 13% of adults aged 65 to 69 report balance-related issues-a figure that rises sharply to 46% among those aged 85 and older. Similarly, gait disorders are a prevalent concern, affecting approximately 35% of non-institutionalized adults aged 70 and older. These disorders are not only linked to reduced mobility but also correlate with a 2.2-fold increase in the risk of institutionalization and mortality compared to those without gait issues [5]. These statistics underscore the urgent need for early identification, prevention strategies, and tailored interventions to maintain mobility and reduce health risks in aging populations. Given the serious consequences of falls among older adults, assessing balance disorders is a standard and essential practice in geriatric care and rehabilitation. Early identification and intervention can significantly reduce the risk of falls, preserve independence, and improve overall quality of life.

Clinical tools such as the Berg Balance Scale, Timed Up and Go (TUG) test, Functional Reach Test, and Tinetti Test are widely used due to their efficiency, reliability, and ability to provide valuable insights into fall risk. However, these assessments rely heavily on subjective interpretation by evaluators, which can compromise their accuracy and consistency. Furthermore, they may lack the sensitivity required to distinguish between individuals in relatively healthy populations, limiting their utility in early or subtle balance impairments [6].

populaciji, što ograničava njihovu primenu u otkrivanju ranih ili suptilnih poremećaja ravnoteže [6].

Ove kliničke potrebe dovele su do razvoja instrumentalne procene ravnoteže tokom mirovanja, koja je standardizovana u kliničkoj praksi sredinom 20. veka. Među različitim tehnološkim pristupima, posturografija pomoću platformi za merenje sila izdvojila se kao zlatni standard, koristeći ugrađene senzore sila za kvantifikaciju dinamike centra pritiska. Ova tehnika je poznata pod različitim nazivima, uključujući stabilometriju ili stabilografiju [7].

Ipak, tradicionalna stabilometrija ima određena ograničenja. Stabilometrijske platforme često imaju velike dimenzije i težinu zbog tehničkih zahteva, što ograničava njihovu prenosivost u kliničkom kontekstu. Pored toga, da bi se dobili podaci u koordinatnom sistemu pacijenta – onom koji uzima u obzir orijentaciju i položaj stopala – neophodno je da pacijent postavi stopala na platformu na unapred definisan način. Postoje utvrđeni standardi za postavljanje stopala koji regulišu ovaj proces. U nekim slučajevima, dimenzije stopala pacijenta koriste se za definisanje koordinatnog sistema u kome se prikazuju rezultati ispitivanja [7]. Međutim, ova praksa može uneti varijabilnost i dovesti do relativizacije rezultata merenja, potencijalno utičući na njihovu konzistentnost i uporedivost.

Prikladna alternativa tradicionalnoj stabilometriji jeste merenje parametara ravnoteže pomoću inercijalnih senzora, poput inercijalnih mernih jedinica (IMU), koje obično sadrže trokomponentne akcelerometre. Suštinski, IMU sistemi se zasnivaju na specijalizovanom čipu koji sadrži senzore raspoređene u tri međusobno upravne ravni. Optimalno postavljanje senzora zavisi od zadatka, pri čemu se anatomska pozicija bira strateški da bi se registrovali relevantni kinematički parametri ciljanog posturalnog zadatka [8]. Nosivi inercijalni senzori se najčešće postavljaju u predelu struka ili trupa radi kvantifikacije posturalnog njihanja i kinematike ubrzanja trupa. Alternativne pozicije (donji ekstremiteti, grudna kost, gornji ekstremiteti ili čelo) omogućavaju segment-specifične podatke o pokretima, dok troosne konfiguracije omogućavaju sveobuhvatnu 3D prostorno-vremensku analizu dinamike zglobova i segmenata tela [9].

Važno je napomenuti da su IMU sistemi isplativi, lagani i omogućavaju sprovođenje procene ravnoteže u različitim uslovima, bez prostornog ograničenja, što ih čini naročito pogodnim za testiranje starije populacije. Najznačajnija prednost jeste to što pružaju detaljne informacije o suptilnim promenama u posturalnom njihaju, kako u statičkim, tako i u dinamičkim uslovima.

U našem istraživanju cilj je da pomoću IMU senzora procenimo ravnotežu kod osoba starijih od 65 godina i ispitamo njihovu sposobnost održavanja stabilnosti.

These clinical needs drove the development of instrumental balance assessment during quiet stance, which became standardized in clinical practice during the mid-20th century. Among the various technological approaches developed, force platform posturography emerged as the gold-standard methodology, utilizing embedded force sensors to quantify center-of-pressure dynamics. This technique is also known by several names, including stabilometry or stabilography, among others [7].

The fact is that traditional stabilometry, as it is, has certain limitations. Stabilometric platforms very often have relatively large dimensions and weight due to technical requirements. Therefore, in a clinical context, their use is hampered by a lack of portability. Apart from the mentioned, to obtain data in the patient's coordinate system—specifically, one that considers the orientation and position of the patient's feet—it is necessary to position the feet on the measurement platform in a predefined manner. Established standards for foot placement exist to guide this process. In some instances, the dimensions of the patient's feet are also used to define the coordinate system in which examination results are presented [7]. However, this practice can introduce variability and lead to a relativization of the measurement outcomes, potentially affecting their consistency and comparability.

A suitable alternative to traditional stabilometry is the measurement of balance parameters using inertial sensors, such as inertial measurement units (IMUs), which typically contain three-component accelerometers. Essentially, IMU systems are based on a specialized chip that contains sensors located in three mutually perpendicular planes. Optimal sensor positioning is task-dependent, with anatomical placement strategically selected to capture relevant kinematic parameters for the targeted postural assessment [8]. Wearable inertial sensors are typically positioned at the waist or trunk to quantify postural sway and trunk acceleration kinematics. Alternative mounting locations (lower limbs, sternum, upper extremities, or forehead) provide segment-specific movement data, with triaxial configurations enabling comprehensive 3D spatiotemporal analysis of joint and body segment dynamics [9].

After all, it is worth noting that IMU systems, being cost-effective, lightweight, and capable of administering postural assessments in diverse environments without spatial constraints, are particularly suitable for testing the elderly population. The most important aspect is that they provide detailed information on subtle changes in postural sway for both static and dynamic conditions.

In our study, we aim to use an IMU sensor to assess individuals over 65 years of age and evaluate their ability to maintain balance.

METODE

Učesnici

U istraživanju je učestvovalo 34 zdrava odrasla ispitanika (muškaraca 5; žena 29), starosti 65 godina i više, podeljenih u dve grupe (65–75 godina i >75 godina). Isključeni su ispitanici sa neurološkim, ortopedskim ili kardiovaskularnim oboljenjima koja utiču na ravnotežu, oni koji koriste pomagala za kretanje, kao i osobe koje uzimaju relevantne lekove. Svi učesnici dali su pismeni pristanak, a istraživanje je odobrio Etički komitet FSBI pri Centru za mozak i neurotehnologiju (br. 7, 19. jul 2021), u skladu sa Helsinškom deklaracijom.

Dizajn studije i postupci merenja

Procena ravnoteže vršena je pomoću Neurosoft IMU senzora (Neurosoft, Ivanovo, Rusija), postavljenog u nivou sakruma (L2–S2) pomoću elastičnog pojasa, u skladu sa utvrđenom metodologijom [8] (Slika 1). Ovakvo pozicioniranje omogućava registrovanje oscilacija tela u blizini centra mase, uz praćenje pokreta karlice. Ispitanici su stajali u polu-tandem položaju (dominantna noga napred, ruke na kukovima) sa otvorenim očima u trajanju od 30 sekundi, mirno i bez pokreta. Nakon inicijalne probe za upoznavanje sa zadatkom, sprovedene su tri test-repeticije, sa pauzama od po 10 sekundi između svake probe. Ugrađeni troosni akcelerometar beležio je podatke frekvencijom od 200 Hz, uz bežični prenos na namenski softver na računaru radi analize.

U istraživanju smo analizirali parametre posturalne stabilnosti merenjem pomoću IMU senzora. Za svakog ispitanika izračunate su prosečne vrednosti iz tri merenja za sledeće pokazatelje:

- sway mean X – prosečan pomeraj centra pritiska (COP) u levo-desno (X) pravcu,
- sway mean Y – prosečan pomeraj COP u antero-posteriornom (Y) pravcu,
- prosečna brzina pomeranja,
- površina elipse koja obuhvata 95% oscilacija.

Statistička analiza

Kolmogorov–Smirnov i Shapiro–Wilk testovi korišćeni su za procenu normalnosti distribucije podataka. Pošto podaci nisu pratili normalnu distribuciju, za poređenje razlika između dve grupe korišćen je Mann–Whitney U test, a rezultati su prikazani kao medijane (sa minimalnim i maksimalnim vrednostima).

REZULTATI

Grupa ≥ 75 godina pokazala je veće prosečne oscilacije u oba smera, X i Y, što može ukazivati na veću nestabilnost (Tabela 1). Međutim, ove razlike nisu bile statistički značajne ($p > 0,05$). Slično tome, nisu uočene značajne razli-

METHODS

Participants

The study included 34 healthy adults (male, 5; female, 29) aged 65 years or older, divided into two groups (65–75 years and >75 years). We excluded participants with neurological, orthopedic, or cardiovascular conditions that affected balance, those using mobility aids, and individuals taking relevant medications. Participants provided written informed consent, and the study was approved by the Ethical Committee of FSBI at the Center for Brain and Neurotechnology (No. 7, July 19, 2021), in accordance with the Declaration of Helsinki.

Study design and measurement procedures

Balance assessments were performed using the Neurosoft IMU sensor (Neurosoft, Ivanovo, Russia), positioned near the sacrum level (L2–S2) via an elastic band holder, in accordance with established methodology [8] (Figure 1). This placement captures body oscillations near the center of mass while monitoring pelvic movements. Participants maintained a semi-tandem stance (dominant leg forward, hands on hips) with eyes open for 30 seconds, remaining motionless. Following an initial familiarization trial, three test repetitions were conducted, with 10-second rests between each trial. The integrated triaxial accelerometer recorded data at 200 Hz, with wireless transmission to dedicated PC software for analysis.



Slika 1. Postavljanje IMU senzora za merenje ravnoteže

Figure 1. Set up for balance measurements with the IMU sensor

Tabela 1. Poređenje grupa (<75 vs. ≥75)

Parametar / Parameter	Grupa / Group <75 Median (min, max)	Grupa / Group ≥75 Median (min, max)	p-vrednost / p-value
Sway Mean X (°)	0.026 (-0.584-0.968)	0.086 (-0.110-0.780)	0.255
Sway Mean Y (°)	0.047 (-1.093-0.910)	0.280 (-0.638-1.320)	0.581
Sway Velocity (°/s)	2.189 (1.342-3.286)	1.910 (0.780-3.638)	0.241
Ellipse Area (°²)	3.905 (1.589-32.884)	4.084 (0.780-9.242)	0.679

ke u brzini pomeranja niti u površini elipse, što sugerise da se grupe ne razlikuju u ukupnoj posturalnoj kontroli.

Muškarci su pokazali statistički značajno veće oscilacije u X pravcu ($p = 0,038$), dok su žene imale veću brzinu pomeranja i površinu elipse, iako te razlike nisu bile statistički značajne (Tabela 2).

DISKUSIJA

Istraživanje posturalne stabilnosti kod zdravih starijih osoba pomoću IMU senzora otkrilo je određene trendove, iako većina rezultata nije dostigla statističku značajnost. Ovi nalazi mogu pružiti uvid u proces starenja i njegov uticaj na ravnotežu, istovremeno otvarajući pitanja za dalja istraživanja.

Povećane oscilacije u X i Y pravcu kod ispitanika starijih od 75 godina (Tabela 1) u skladu su sa prethodnim studijama koje ukazuju na progresivno pogoršanje ravnoteže sa starenjem [10,11]. Ovo se može pripisati opadanju senzorne i motoričke funkcije, uključujući gubitak mišićne mase i oštećenje vestibularnog sistema [11,12]. Međutim, odsustvo statistički značajnih razlika u brzini njihivanja i površini elipse može ukazivati na to da zdrave starije osobe održavaju stabilnost u statičkim uslovima pomoću kompenzatornih mehanizama [13]. Blago povećanje oscilacija kod starijih ispitanika može imati klinički značaj, jer prethodna istraživanja pokazuju da čak i male promene mogu povećati rizik od padova [14,15].

Table 1. Group comparisons (< 75 vs. ≥ 75)

In the study, we analyzed parameters of postural stability measured using IMU sensors. For each participant, average values were calculated from three measurements for the following indicators:

- sway mean X – mean center of pressure (COP) displacement in the left-right (X) direction,
- sway mean Y – mean COP displacement in the anterior-posterior (Y) direction,
- mean sway velocity,
- ellipse area encompassing 95% of oscillations.

Statistical analysis

The Kolmogorov–Smirnov and Shapiro–Wilk tests were used to assess the normality of data distribution. Since the data did not follow a normal distribution, the Mann–Whitney U test was used to compare differences between the two groups, and the data were presented as medians (with minimum and maximum values).

RESULTS

The group ≥ 75 showed greater mean oscillations in both the X and Y directions, which may indicate higher instability (Table 1). However, these differences were not statistically significant ($p > 0.05$). Similarly, there were no significant differences in sway velocity or ellipse area, suggesting that the groups did not differ in overall postural control.

Tabela 2. Gender comparisons (Female vs. Male) for both subgroups

Parametar / Parameter	Žene /Female Median (min, max)	Muškarci / Male Median (min, max)	p-vrednost / p-value
Sway Mean X (°)	0.026 (-0.584-0.739)	0.181 (0.063-0.780)	0.038*
Sway Mean Y (°)	0.208 (-1.093-1.320)	0.147 (-0.638-0.880)	0.847
Sway Velocity (°/s)	2.057 (1.342-3.638)	1.797 (0.780-2.447)	0.192
Ellipse Area (°²)	4.132 (1.589-32.884)	3.812 (0.780-5.449)	0.530

* $p < 0,05$ se smatra statistički značajnim

Table 2. Gender comparisons (Female vs. Male) for both subgroups

* $p < 0.05$ considered statistically significant

Polne razlike u posturalnoj kontroli manifestuju se prvenstveno u mediolateralnom njihaju tokom statičkog stajanja [16,17]. Posebno, stabilizacija stava (šire postavljanje stopala) dovodi do veće redukcije njihanja kod starijih muškaraca u poređenju sa ženama, što sugerije da muškarci pokazuju slabiju stabilnost u uskim stavovima [18]. Iako su ove razlike suptilne, one ukazuju na potrebu za polno specifičnim pristupima u proceni i tretmanu poremećaja ravnoteže.

Upotreba IMU senzora omogućila je jednostavnu i objektivnu procenu ravnoteže u prirodnim uslovima. Ovi senzori su pouzdani alati za merenje posturalne stabilnosti, posebno u mediolateralnom pravcu kod zadataka niskog nivoa težine [19]. U kontekstu predviđanja padova, inercijalne merne jedinice (IMU), najčešće predstavljene akcelerometrima, korišćene su za razlikovanje osoba sklonih padovima od onih koji nisu, kao i za procenu rizika od padanja [20].

Međutim, mali uzorak i homogena populacija mogli su doprineti odsustvu značajnih razlika. Buduća istraživanja trebalo bi da uključe veći broj ispitanika i osobe sa blagim poremećajima ravnoteže kako bi se bolje razumeli rani znaci rizika od padova. Takođe, procena dodatnih parametara (npr. frekvencijski spektar oscilacija) mogla bi dati preciznije zaključke.

Iako su razlike bile male, kontinuirano praćenje posturalne stabilnosti pomoću IMU senzora može biti korisno za rano otkrivanje promena koje prethode padovima [20]. Ova tehnologija nudi prednosti u odnosu na kliničke testove omogućavajući kvantitativnu i ponovljivu procenu sa minimalnom opremom. Perspektivno, kombinovanje IMU senzora sa drugim modalitetima, kao što su EEG ili elektromiografija, moglo bi pružiti dublji uvid u mehanizme održavanja ravnoteže [21].

ZAKLJUČAK

Ovo istraživanje može doprineti razumevanju promena u kontroli ravnoteže povezanih sa starenjem i ukazuje na potencijalnu kliničku primenu IMU senzora za procenu posture. Praktične prednosti našeg protokola sa IMU senzorom postavljenim na sakrum – uključujući prenosivost, primenjivost u realnim uslovima i biomehaničku relevantnost za kretanje COM – čine ovaj pristup vrednim alatom za gerijatrijske procene u zajednici.

Buduća istraživanja trebalo bi da se fokusiraju na proširenje uzorka i integraciju podataka dobijenih senzorima sa kliničkim merama ravnoteže kako bi se omogućila preciznija stratifikacija rizika.

Sukob interesa: Nije prijavljen.

Males exhibited statistically significantly greater oscillations in the X direction ($p = 0.038$), while females showed higher sway velocity and ellipse area, although these differences were not statistically significant (Table 2).

DISCUSSION

The investigation of postural stability in healthy older adults using IMU sensors revealed specific trends, although most results did not reach statistical significance. These findings may provide insights into the aging process and its impact on balance, while simultaneously raising questions for further research.

Increased oscillations in the X and Y directions in participants older than 75 years (Table 1) are consistent with existing studies, which indicate a progressive deterioration of balance with age [10,11]. This can be attributed to the decline in sensory and motor functions, including loss of muscle mass and impairment of the vestibular system [11,12]. However, the absence of statistically significant differences in sway velocity and ellipse area may suggest that healthy older adults maintain stability in static conditions through compensatory mechanisms [13]. The slight increase in oscillations among older participants may have clinical significance, as previous research shows that even minor changes can increase fall risk [14,15].

Gender differences in postural control manifest primarily in mediolateral sway during static standing [16,17]. Notably, stance stabilization (wider foot placement) produces greater sway reduction in older males compared to females, suggesting males exhibit poorer stability in narrow stance configurations [18]. These differences, though subtle, indicate the need for gender-specific approaches in balance disorder assessment and treatment.

The use of IMU sensors enabled a simple and objective assessment of balance in natural conditions. Those are reliable tools for measuring postural stability, particularly excelling in the mediolateral direction for low-difficulty tasks [19]. In the context of fall prediction, inertial measurement units (IMUs), typically represented by accelerometers, have been used to distinguish between fallers and non-fallers, as well as to assess the risk of falling [20].

However, the small sample size and homogeneous population may have contributed to the lack of significant differences. Future studies should include larger participant numbers and individuals with mild balance disorders to understand the early signs of fall risk better. Additionally, evaluating further parameters (e.g., the frequency spectrum of oscillations) could yield more precise conclusions.

LITERATURA / REFERENCES

1. Rogers MW, Mille M-L. Balance perturbations. *Handb Clin Neurol*. 2018;159:85-105.
 2. Kongsawasdi S, Wiboonsuntharakoon C, Tajarennmuang P, Wantanajittikul K. Feasibility study of a prototype wearable inertial measurement unit for elderly postural sway assessment. *J Clin Med Res*. 2024 Apr;16(4):174-81. doi:10.14740/jocmr5125.
 3. Panjan A, Sarabon N. Review of methods for the evaluation of human body balance. *Sport Sci Rev*. 2010 Dec;19(5-6):131-63.
 4. Horak FB. Postural orientation and equilibrium: what do we need to know about neural control of balance to prevent falls? *Age Ageing*. 2006 Sep;35 Suppl 2:ii7-ii11. doi: 10.1093/ageing/af1077.
 5. Rodríguez-Almagro D, Achalandabaso-Ochoa A, Ibáñez-Vera AJ, Góngora-Rodríguez J, Rodríguez-Huguet M. Effectiveness of virtual reality therapy on balance and gait in the elderly: a systematic review. *Healthcare (Basel)*. 2024 Jan;12(2):158. doi:10.3390/healthcare12020158.
 6. Kongsawasdi S, Bunjan P, Wongjak M, Saenmueng W, Wantanajittikul K. Evaluating postural sway in the elderly using inertial measurement units: a study on center of mass measurements via accelerometers and gyroscopes. *J Clin Med Res*. 2025 Apr;17(4):200-7. doi:10.14740/jocmr6184.
 7. Skvortsov D, Painev N. Postural stability Romberg's test in 3D using an inertial sensor in healthy adults. *Symmetry (Basel)*. 2023 May;15(5):1125. doi:10.3390/sym15051125.
 8. Ghislieri M, Gastaldi L, Pastorelli S, Tadano S, Agostini V. Wearable inertial sensors to assess standing balance: a systematic review. *Sensors (Basel)*. 2019 Sep;19(19):4075. doi:10.3390/s19194075.
 9. Zampogna A, Mileti I, Palermo E, Celletti C, Paoloni M, Manoni A, et al. Fifteen years of wireless sensors for balance assessment in neurological disorders. *Sensors (Basel)*. 2020 Jun;20(11):3247. doi:10.3390/s20113247.
 10. Lockhart TE, Frames CW, Soangra R, Lieberman A. Effects of Obesity and Fall Risk on Gait and Posture of Community-Dwelling Older Adults. *Int J Progn Health Manag*. 2019;10(1):019.
 11. Wang J, Li Y, Yang GY, Jin K. Age-related dysfunction in balance: a comprehensive review of causes, consequences, and interventions. *Aging Dis*. 2024;16(2):714-37. doi:10.14336/AD.2024.0124-1.
 12. Iwasaki S, Yamasoba T. Dizziness and imbalance in the elderly: age-related decline in the vestibular system. *Aging Dis*. 2015;6(1):38-47. doi:10.14336/AD.2014.0128.
 13. Virk S, McConville KM. Virtual reality applications in improving postural control and minimizing falls. *Conf Proc IEEE Eng Med Biol Soc*. 2006;2006:2694-7. doi:10.1109/IEMBS.2006.260751.
 14. Hodgson G, Pace A, Carfagnini Q, Ayanso A, Gardner P, Narushima M, et al. Risky business: factors that increase risk of falls among older adult in-patients. *Gerontol Geriatr Med*. 2023;9:23337214231189930. doi:10.1177/23337214231189930.
 15. Hsieh KL, Speiser JL, Neiberg RH, Marsh AP, Tooze JA, Houston DK. Factors associated with falls in older adults: a secondary analysis of a 12-month randomized controlled trial. *Arch Gerontol Geriatr*. 2023;108:104940. doi:10.1016/j.archger.2023.104940.
 16. Kim JW, Eom GM, Kim CS, Kim DH, Lee JH, Park BK, et al. Sex differences in the postural sway characteristics of young and elderly subjects during quiet natural standing. *Geriatr Gerontol Int*. 2010;10(2):191-8. doi:10.1111/j.1447-0594.2009.00576.x.
 17. Kim JW, Kwon Y, Ho Y, Jeon HM, Bang MJ, Jun JH, et al. Age-gender differences in the postural sway during squat and stand-up movement. *Biomed Mater Eng*. 2014;24(6):2707-13. doi:10.3233/BME-141088.
- Although the differences were slight, continuous monitoring of postural stability using IMU sensors could be beneficial for early detection of changes that precede falls [20]. This technology offers advantages over clinical tests by enabling quantitative and repetitive assessment with minimal equipment. Prospectively, combining IMU sensors with other modalities, such as EEG or electromyography, could provide deeper insight into the mechanisms of balance maintenance [21].

CONCLUSION

This study may contribute to the understanding of age-related changes in balance control and demonstrates the potential clinical utility of IMU sensors for postural assessment. The practical advantages of our sacral-mounted IMU protocol – including portability, real-world applicability, and biomechanical relevance to COM movements – position this approach as a valuable tool for community-based geriatric assessments.

Future research should focus on expanding the sample size and integrating sensor-derived data with clinical balance measures to enable more precise risk stratification.

Conflict of interest: None declared

18. Sullivan EV, Rose J, Rohlfing T, Pfefferbaum A. Postural sway reduction in aging men and women: relation to brain structure, cognitive status, and stabilizing factors. *Neurobiol Aging*. 2009;30(5):793-807. doi:10.1016/j.neurobiolaging.2007.08.021.
19. Liu Y, Liu X, Wang Z, Wang J, Zhang H, Guo L. Improving performance of human action intent recognition: analysis of gait recognition machine learning algorithms and optimal combination with inertial measurement units. *Comput Biol Med*. 2023;163:107192. doi:10.1016/j.combiomed.2023.107192.
20. Wang T, Liu M, Bao B, Zhang Y, Wang J, Liu Y. Balance evaluation system using wearable IMU sensing. *Meas Control*. 2024;58(2):281-92. doi:10.1177/00202940241258828.
21. Germanotta M, Mileti I, Conforti I, Del Prete Z, Aprile I, Palermo E. Estimation of human center of mass position through the inertial sensors-based methods in postural tasks: an accuracy evaluation. *Sensors (Basel)*. 2021;21(2):601. doi:10.3390/s21020601.

PUBLIC HEALTH ASPECTS – MISUSE AND INAPPROPRIATE USE OF ANTIBIOTICS

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SAŽETAK

Uvod/Cilj: Antibiotici od svog otkrića predstavljaju ključnu odbranu od bakterijskih infekcija, ali sve veći broj sojeva razvija otpornost putem spontanih genetskih mutacija i sticanja gena rezistencije, što se dodatno podstiče njihovom nepravilnom i učestalom upotrebom. Ovaj pregled literature obuhvata radove objavljene od 2010. do 2024. godine i analizira četiri ključne oblasti: zloupotrebu i neadekvatnu primenu antibiotika, razvoj superbakterija, globalne aspekte antimikrobne rezistencije (AMR) i preventivne strategije sa naglaskom na ulogu vitamina. Cilj ovog pregleda je da prikaže dokaze o zloupotrebi antibiotika, razvoju rezistencije i preventivnim strategijama, sa posebnim osvrtom na značaj vitamina u očuvanju imuniteta i unapređenju rada zdravstvenih sistema.

Metode: U pregled literature uključeni su radovi objavljeni u periodu od 2010. do 2024. godine, sa fokusom na analizu nepravilne upotrebe antibiotika, razvoj superbakterija, globalni uticaj AMR-a i ulogu vitamina u preventivnim strategijama.

Rezultati: Rezultati pokazuju da su najčešći uzroci neadekvatne terapije samoinicijativno uzimanje lekova, propisivanje bez mikrobiološke potvrde i loša komunikacija između lekara i pacijenta. AMR je prepoznat kao jedna od najvećih pretnji javnom zdravlju, sa značajnim posledicama po morbiditet, mortalitet i troškove zdravstvenog sistema. Preventivne mere obuhvataju edukaciju zdravstvenih radnika i stanovništva, regulisanje prodaje antibiotika, razvoj novih dijagnostičkih i terapijskih metoda, kao i promociju zdravih navika. Poseban značaj imaju vitamini sa antioksidativnim svojstvima (retinol, tokoferol i L-askorbinska kiselina), koji mogu smanjiti potrebu za antibioticima, posebno uz doprinos vitamina D, za koji je poznato da stimuliše imuni sistem.

Zaključak: Integrirani pristup, u skladu sa konceptom One Health, ključan je za očuvanje efikasnosti postojećih lekova i smanjenje javnozdravstvenog opterećenja uzrokovano AMR-om.

Ključne reči: antibiotici, antimikrobna rezistencija, racionalna upotreba, crevna mikrobiota, vitamini, javno zdravlje

ABSTRACT

Introduction/Aim: Since their discovery, antibiotics have represented a key defense against bacterial infections, but an increasing number of strains are developing resistance through spontaneous genetic mutations and the acquisition of resistance genes, a process further stimulated by their improper and frequent use. This literature review encompasses studies published between 2010 and 2024 and analyzes four key areas: the misuse and inappropriate application of antibiotics, the development of superbugs, the global aspects of antimicrobial resistance (AMR), and preventive strategies with an emphasis on the role of vitamins. This review aims to present evidence on antibiotic misuse, resistance development, and preventive strategies, with particular attention to the importance of vitamins in maintaining immunity and improving the functioning of healthcare systems.

Methods: This literature review includes studies published from 2010 to 2024, focusing on the analysis of antibiotic misuse, the development of superbugs, the global impact of AMR, and the role of vitamins in prevention strategies.

Results: The results indicate that the most common causes of inadequate therapy are self-medication, prescription without microbiological confirmation, and poor communication between physicians and patients. AMR has been recognized as one of the greatest threats to public health, with significant consequences for morbidity, mortality, and healthcare system costs. Preventive measures include education of healthcare professionals and the general population, regulation of antibiotic sales, the development of new diagnostic and therapeutic methods, and the promotion of healthy lifestyle habits. Of particular importance are vitamins with antioxidant properties (retinol, tocopherol, and L-ascorbic acid), which may reduce the need for antibiotics, especially with the contribution of vitamin D, known to stimulate the immune system.

Conclusion: An integrated approach, in line with the One Health concept, is crucial for preserving the effectiveness of existing drugs and reducing the public health burden caused by AMR.

Keywords: antibiotics, antimicrobial resistance, rational use, intestinal microbiota, vitamins, public health

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UVOD

Nedavni podaci ukazuju na značajan izazov sa kojim se suočavaju zdravstveni sistemi širom sveta. Procene pokazuju da bi antimikrobna rezistencija (AMR) mogla rezultirati sa 10 miliona smrtnih slučajeva godišnje na globalnom nivou i smanjenjem globalnog bruto domaćeg proizvoda za 2% do 3,5%, uz ekonomske posledice koje bi do 2050. godine mogle dostići 100 triliona američkih dolara [1–3]. Rastuća učestalost infekcija i smrtnih slučajeva povezanih sa antimikrobnom rezistencijom (oko 70% infekcija izazvanih bakterijama otpornim na antibiotike javlja se u zdravstvenim ustanovama) primećuje se kod gotovo svih bakterijskih sojeva i srodnih antibiotskih terapija [1–3]. Svetska zdravstvena organizacija je 2019. godine prepoznala AMR kao jednu od deset najvažnijih globalnih opasnosti po javno zdravlje sa kojima se suočava čovečanstvo, dok su Evropska komisija i države članice EU od jula 2022. godine svrstale AMR među tri primarne zdravstvene pretnje [1–3]. Ova zabrinjavajuća situacija ukazuje na potrebu jačanja mera kontrole infekcija, unapređenje svesti i intenziviranje istraživačkih napora [1–3].

Antimikrobna rezistencija (AMR) predstavlja sposobnost mikroorganizama, uključujući bakterije, viruse, gljivice i parazite, da izbegnu dejstvo antimikrobnih lekova koji su ranije bili efikasni u njihovom suzbijanju. Ovaj proces nastaje kao rezultat prirodne selekcije i adaptacije mikroorganizama, uključujući spontane genetske mutacije i horizontalni prenos gena otpornosti, što dovodi do smanjenja ili potpunog gubitka efikasnosti standardnih terapija [1,2].

Antibiotici su biološki važna organska jedinjenja koja su svojim dejstvom spasili mnoge živote širom sveta. Njihovo dejstvo zasniva se na različitim mehanizmima ometanja funkcija bakterijske ćelije. Neki antibiotici deluju bakteriostatski, a neki bakteriocidno. Bakteriocidne grupe antibiotika dovode do smrti bakterije dok bakteriostatski antibiotici imaju mogućnost da bakterije drže u stazi što znači da ona neće moći da se množi i da obavlja svoje fiziološke potrebe. Ujedno će biti podložna odgovoru antitela i beloj krvnoj lozi koja se nalazi u svakom živom biću i koja će putem bele krvne loze, antitela ali i komponenta komplementa dovesti do smrti bakterijskih ćelija. Dok bakteriocidni antibiotici ometaju direktno bakterijsku ćeliju izazivajući njenu smrt na različite načine. Mehanizmi delovanja bakteriocidnih antibiotika uključuju oštećenje membrane i ćelijskog zida bakterijske ćelije, ometanje metaboličkih procesa, oštećenje RNK molekula i proteina odgovornih za ispravljanje grešaka tokom deobe ćelija, kao i direktno oštećenje DNK. Ovo su samo neki od datih mehanizama.

Antibiotici su, od revolucionarnog otkrića do danas, ostali glavna linija odbrane od bakterija. Međutim,

INTRODUCTION

Recent figures underscore a significant dilemma within healthcare systems worldwide. Estimates suggest that AMR could result in 10 million deaths annually on a global scale and a reduction of the global gross domestic product by 2% to 3.5%, with economic consequences potentially reaching 100 trillion US dollars by 2050 [1–3]. The rising incidence of infections and deaths associated with antimicrobial resistance (with around 70% of infections caused by antibiotic-resistant bacteria taking place in healthcare facilities) has been observed across nearly all bacterial strains and the related antibiotic therapies [1–3]. In 2019, the World Health Organization (WHO) recognized antimicrobial resistance as one of the ten foremost global public health threats confronting humanity, while the European Commission and EU member states identified AMR as one of the three primary health threats as of July 2022 [1–3]. This alarming situation highlights the need to strengthen infection control measures, raise awareness, and intensify research efforts [1–3].

Antimicrobial resistance (AMR) refers to the ability of microorganisms, including bacteria, viruses, fungi, and parasites, to evade the effects of antimicrobial agents that were previously effective in eliminating them. This process occurs as a result of natural selection and adaptation of microorganisms, including spontaneous genetic mutations and horizontal transfer of resistance genes, leading to a reduction or complete loss of effectiveness of standard therapies [1,2].

Antibiotics are biologically important organic compounds that have saved countless lives worldwide. They act in different ways to disrupt the physiological processes and structural integrity of bacterial cells. Some antibiotics act bacteriostatically, while others are bactericidal. Bactericidal groups of antibiotics induce bacterial cell death, whereas bacteriostatic antibiotics halt bacterial growth and reproduction, which means that they will not be able to multiply and perform their physiological needs and will be susceptible to the response of antibodies and white blood cells found in every living being and which, through white blood cells, antibodies and complement components, will lead to the bacterial eradication. Bactericidal antibiotics exert their effects by directly targeting the bacterial cell, leading to cell death through various mechanisms. Some of them damage the bacterial cell membrane and cell wall, while others suppress essential metabolic processes. Certain agents impair RNA molecules and specific proteins involved in the correction of errors during cell division, and some act directly on the bacterial DNA itself. These are just some of the known mechanisms.

From their revolutionary discovery until today, antibiotics have served as the main line of defense against

sve veći broj različitih sojeva bakterija razvija otpornost putem endogenih mehanizama, uključujući spontane genetske mutacije i sticanje ili ekspresiju gena otpornosti. Pored ovih inherentnih puteva, nepotrebno i neopravdano izlaganje bakterija antibioticima može dovesti do ovog fenomena. Bakterije često ne postaju odmah potpuno otporne. U početku razvijaju osetljivost, osetljivost bakterija je označena sa "S" (osetljiva), a zatim ulaze u stanje parcijalne osetljivosti, što je označeno sa "I" (srednja osetljivost). Tek nakon ponovljenog izlaganja datom antibiotiku dolazi do potpune rezistencije, što je na antibiogramu naznačeno sa "R" (otporan). Procenjuje se da će do 2050. godine nivo bakterijske rezistencije na antibiotike dostići veoma visoke razmere [1]. Takođe je važno napomenuti da određene klase antibiotika sintetizuju ljudi i ne mogu se naći u prirodi. Nasuprot tome, određene grupe antibiotika sintetizuju drugi mikroorganizmi, odnosno mogu se naći u prirodi. Čak i kada se pravilno koriste, antibiotici mogu izazvati ozbiljne neželjene efekte ako se ne koriguju na vreme. Ovo uvodi važnu etičku dimenziju, kao i odgovornost kliničara koji propisuje antibiotik [2].

Cilj ovog pregleda literature je da prikaže najnovije naučne dokaze o zloupotrebi i neadekvatnoj upotrebi antibiotika, razvoju superbakterija povezanih sa njihovom prekomernom primenom, globalnim aspektima antimikrobne rezistencije i preventivnim strategijama, sa posebnim naglaskom na ulogu vitamina u očuvanju imunološke funkcije. Svrha rada je da se doprinese boljoj zaštiti ugroženih populacija, unapređenju racionalne primene antibiotika i efikasnijem radu zdravstvenih sistema.

Značaj antimikrobne rezistencije (AMR)

Antimikrobna rezistencija (AMR) predstavlja jedan od najvećih izazova savremene medicine i javnog zdravlja, sa potencijalno katastrofalnim posledicama na globalnom nivou [1–3]. Prema najnovijim procenama, ukoliko se trenutni trend porasta rezistencije nastavi, do 2050. godine AMR bi mogao uzrokovati do 10 miliona smrtnih slučajeva godišnje, uz smanjenje globalnog bruto domaćeg proizvoda za 2–3,5% [1]. Svetska zdravstvena organizacija je 2019. godine svrstala AMR među deset najvećih pretnji po javno zdravlje, dok su institucije Evropske unije 2022. godine prepoznale ovaj problem kao jednu od tri prioritetne zdravstvene pretnje [2,3]. Posebno zabrinjava podatak da se oko 70% infekcija izazvanih bakterijama otpornim na antibiotike javlja u zdravstvenim ustanovama, dok se porast njihove učestalosti beleži se kod gotovo svih značajnih patogenih sojeva [3]. Ovakva situacija zahteva intenziviranje mera kontrole infekcija, povećanje svesti javnosti i zdravstvenih radnika, kao i jačanje istraživačkih aktivnosti usmerenih na pronalaženje novih terapijskih rešenja.

bacteria. However, an increasing number of different strains of bacteria are developing resistance through endogenous mechanisms, including spontaneous genetic mutations and the acquisition or expression of resistance genes. In addition to these inherent pathways, the frequent, unnecessary, and unjustified exposure of bacteria to antibiotics can also lead to this phenomenon. Bacteria often do not immediately become completely resistant. Initially, they develop sensitivity; the sensitivity of bacteria is indicated by "S" (susceptible), then they move into a state of partial sensitivity, which is labeled by "I" (intermediate sensitivity). Only after repeated exposure to a given antibiotic does complete resistance occur, which is indicated on the antibiogram by "R" (resistant). It is estimated that by 2050, there will be very high levels of bacterial resistance to antibiotics [1]. It is also important to note that certain classes of antibiotics are synthesized by humans and cannot be found in nature. In contrast, certain groups of antibiotics are synthesized by other microorganisms, or rather, can be found in nature. Even when used appropriately, antibiotics can cause severe adverse effects if side effects are not promptly managed. This introduces an important ethical dimension, as well as the responsibility of the clinician who prescribes the antibiotic [2].

This literature review aims to present the latest scientific evidence on the misuse and inadequate use of antibiotics, the development of superbugs associated with their overuse, the global aspects of antimicrobial resistance, and preventive strategies, with particular emphasis on the role of vitamins in maintaining immune function. The purpose of the paper is to contribute to better protection of vulnerable populations, the advancement of rational antibiotic use, and the more efficient functioning of healthcare systems.

Significance of Antimicrobial Resistance (AMR)

Antimicrobial resistance (AMR) represents one of the most significant challenges of modern medicine and public health, with potentially catastrophic consequences on a global scale [1–3]. According to the latest estimates, if the current trend of increasing resistance continues, by 2050 AMR could cause up to 10 million deaths annually, accompanied by a 2–3.5% reduction in the global gross domestic product [1]. In 2019, the World Health Organization ranked AMR among the ten greatest threats to public health, while in 2022, European Union institutions recognized this issue as one of the three priority health threats [2,3]. Particularly concerning is the fact that about 70% of infections caused by antibiotic-resistant bacteria occur in healthcare facilities, with an increase in their incidence observed among almost all major pathogenic strains [3].

METOD

Pretraga literature sprovedena je u bazama MEDLINE i PubMed korišćenjem kombinacije ključnih reči na engleskom jeziku, vezanih za antibiotike, antimikrobnu rezistenciju, prevenciju, racionalnu upotrebu i mikrobiotu. U obzir su uzeti radovi objavljeni u periodu od 2010. do 2024. godine. Uključena su originalna istraživanja, sistematski i narativni pregledi, kliničke studije i relevantni izveštaji međunarodnih zdravstvenih organizacija. Isključeni su radovi bez naučne metodologije i oni koji nisu pružali empirijske podatke o prevalenciji i posledicama neadekvatne upotrebe antibiotika. Analiza je sprovedena kvalitativnim pristupom, a nalazi su grupisani u tematske celine koje obuhvataju ključne aspekte problema i mogućnosti prevencije.

Pregled članka zasnivao se na kvalitativnoj analizi sadržaja radova i empirijskih podataka, a potom i komparativnoj interpretaciji nalaza iz istraživanja. Dobijeni rezultati istraživanja su potom tematski kategorisani u četiri teme (Slika 1): zloupotreba i neadekvatna upotreba antibiotika [3–18], razvoj superbakterija povezan sa prekomernom upotrebom antibiotika [18–29], globalni aspekti antimikrobne rezistencija [30–33], i strategije prevencije prekomerne upotrebe antibiotika [34–39].

Zloupotreba i neadekvatna upotreba antibiotika

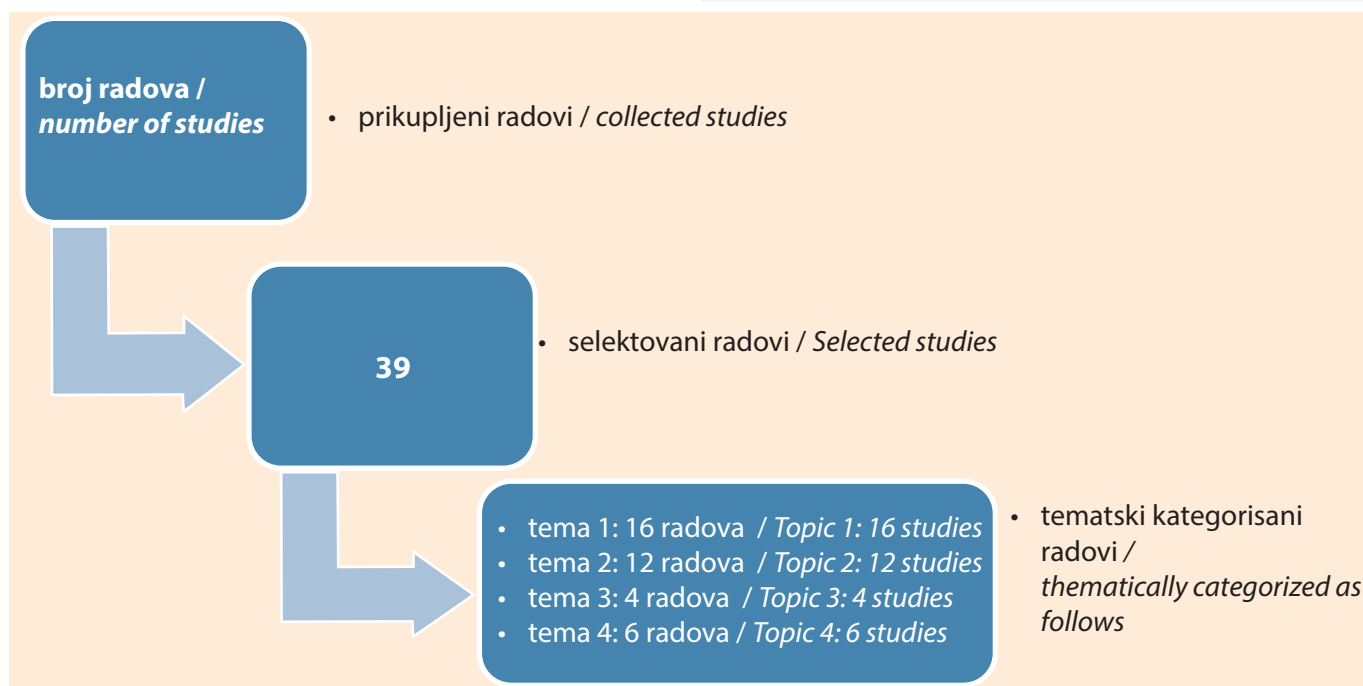
Glavni uzrok trenutne globalne krize jeste prekomerna upotreba i zloupotreba antimikrobnih sredstava, kao što je ranije pomenuto. Značajno je da brojne studije

This situation requires intensifying infection control measures, increasing awareness among the public and healthcare professionals, and strengthening research activities aimed at finding new therapeutic solutions.

METHOD

The literature search was conducted in the MEDLINE and PubMed databases using a combination of English-language keywords related to antibiotics, antimicrobial resistance, prevention, rational use, and microbiota. The review included studies published between 2010 and 2024. Original research articles, systematic and narrative reviews, clinical studies, and relevant reports from international health organizations were included. Studies without scientific methodology and those that did not provide empirical data on the prevalence and consequences of inappropriate antibiotic use were excluded. The analysis was conducted using a qualitative approach, and the findings were grouped into thematic units covering key aspects of the problem and prevention opportunities.

The review was based on a qualitative analysis of the content of the studies and empirical data, followed by a comparative interpretation of the research findings. The obtained results were then thematically categorized into four topics (Figure 1): misuse and inadequate use of antibiotics [3–18], the development of superbugs associated with the overuse of antibiotics [18–29], global aspects of antimicrobial resistance [30–33], and strategies for preventing antibiotics overuse [34–39].



Slika 1. Proces urađenog pregleda literature o samoupotrebi i zloupotrebi antibiotika za period

Figure 1. Process of the literature review on self-medication and misuse of antibiotics for the period

predviđaju da godišnje na globalnom nivou ima 10 miliona smrtnih slučajeva uzrokovanih infekcijom rezistentnih bakterijskih sojeva. Stoga treba uzeti u obzir činjenicu da većina rezistentnih antibakterijskih sredstava predstavlja problem javnog zdravlja koji zahteva multidisciplinarni pristup i hitnu implementaciju globalnih mera javnog zdravlja [3]. Sve alarmantnija briga za javno zdravlje su bakterije koje su već rezistentne na skoro 99% antibiotika, što je dokumentovano u originalnom istraživanju sprovedenom na Institutu za plućne bolesti Vojvodine, Sremska Kamenica, Srbija [4]. Ova studija pokazuje da je bakterija *Clostridium difficile* do sada bila osetljiva samo na tri antibiotika: vankomicin, teikoplanin i metronidazol. Međutim, tokom vremena bakterija je razvila otpornost na ove agense. Za rešavanje teških bolesti koje su posledica komplikacija *C. difficile*, uvođenje novog makrolidnog antibiotika, fidaxomicina, može ponuditi i terapijske i profilaktičke koristi. Njegova upotreba može pomoći u sprečavanju recidiva i smanjiti rizik od progresije bolesti povezane sa ovom infekcijom [4]. U randomizovanoj studiji sprovedenoj između 2017. i 2019. godine, u kojoj su kliničari i roditelji dece uzrasta od jedne do pet godina, koja su primila tretman, učestvovali u obrazovnoj intervenciji. Studija je naglasila ključnu ulogu obrazovanja u poboljšanju ishoda lečenja. Otkriveno je da je jedan od glavnih doprinosa neuspešnom lečenju i neodgovarajućem propisivanju antibiotika bila neadekvatna komunikacija između kliničara, roditelja i pacijenata. Unapređena komunikacija dovela je do poboljšanog uspeha lečenja i informisanije upotrebe lekova [5]. U prospektivnim jednostruko slepim kliničkim studijama sprovedenim širom Sjedinjenih Američkih Država, izvučeno je nekoliko važnih zaključaka. Jedan ključni nalaz je istakao da su mnogi kliničari propisali antibiotike isključivo na osnovu kliničke prezentacije. Iako takva odluka može, u određenim slučajevima, biti medicinski i etički opravdana, oslanjanje samo na kliničku procenu – kada postane rutina i zaobilazi mikrobiološku i laboratorijsku potvrdu – predstavlja dvostruku pretnju javnom zdravlju. Prvo, ova praksa može dovesti do neefikasnog lečenja, jer klinička slika može biti tačna ali ne kazuje da li taj antibiotik deluje na datu kultivisanu bakteriju, zbog čega su neophodne pomenute validacije. Drugi javnozdravstveni problem sa ovim načinom lečenja pacijenta je globalan, jer se ogleda u činjenici da pacijent, osim patološkog uzroka koji nije adekvatno tretiran antibioticima, ostaje organizam domaćina, dok je raznovrsna fiziološka mikrobiota značajno poremećena, čime se povećava tendencija razvoja mikrobiote, otpornost na dati lek [6]. Dvostruko slepa, randomizovana studija sprovedena tokom 6 meseci u 2019. godini pokazala je značajne rezultate

Misuse and inadequate use of antibiotics

The main cause of the current global crisis is the excessive use and misuse of antimicrobial agents, as previously mentioned. Significantly, numerous studies forecast that infections from resistant bacterial strains cause 10 million annual deaths worldwide. Therefore, it should be taken into account that most resistant antibacterial agents represent a public health issue that requires a multidisciplinary approach and the urgent implementation of global public health measures [3]. An increasingly alarming public health concern is bacteria that are already resistant to almost 99% of antibiotics, as documented in original research conducted at the Institute for Pulmonary Diseases of Vojvodina, Sremska Kamenica, Serbia [4]. This study shows the bacterium *Clostridium difficile* has so far been sensitive to only three antibiotics: vancomycin, teicoplanin, and metronidazole. However, over time, the bacterium has also demonstrated evolving resistance to these agents. To address severe diseases resulting from *C. difficile* complications, the introduction of a novel macrolide antibiotic, fidaxomicin, may offer both therapeutic and prophylactic benefits. Its use may help prevent recurrence and reduce the risk of disease progression associated with this infection [4]. A randomized study conducted between 2017 and 2019, involving clinicians and parents of children aged one to five years who had received treatment, included an educational intervention. The study emphasized the critical role of education in improving treatment outcomes. It revealed that one of the main contributors to unsuccessful treatment and inappropriate antibiotic prescribing was inadequate communication between clinicians, parents, and patients. Improved communication led to greater treatment success and more informed use of medications. [5]. In prospective single-blind clinical studies conducted across the United States of America, several important conclusions were drawn. One key finding highlighted that many clinicians prescribed antibiotics solely based on the clinical presentation. While such decisions may, in certain cases, be medically and ethically justified, reliance on clinical judgment alone -when it becomes routine and bypasses microbiological and laboratory confirmation- poses a dual threat to public health. First, this practice may lead to ineffective treatment, as the clinical presentation may be accurate but does not necessarily indicate whether the given antibiotic is effective against the cultured bacterium, which is why laboratory validations are necessary. The other public health problem with this way of treating the patient is global, as it is reflected in the fact that the patient, apart from the pathological cause that has not been treated adequately with antibiotics, remains the host organism, while a colorful physiological microbiota is significantly disturbed, thereby in-

kada se upoređuje indiferentna supstanca sa lekom iz grupe derivata penicilina. Strogi statistički pokazatelji ukazali su da nije bilo značajnih razlika između ove dve grupe subjekata koji su primili ove supstance nakon operacije. Ovde je veoma važno javno zdravlje koje pokazuje kako nepotvrđena laboratorijska upotreba antibiotika pretili na globalnom nivou zbog sve veće pojave rezistencije, kako u derivatima penicilina, tako i u drugim grupama lekova [7]. Randomizovano kontrolisano ispitivanje sprovedeno u Hong Kongu imalo je za cilj da istraži vršnjačko obrazovanje putem društvenih mreža, pokazujući i potvrđujući da je edukacija ključ za sprečavanje razvoja bakterijske rezistencije na antibiotike [8]. Druga randomizovana i dvostruko slepa studija pokazala je važnost komunikacije između lekara i roditelja. S obzirom da je ova komunikacija ključna, posebno ako su pacijenti deca, pravilna heteroanamneza značajno smanjuje prekomernu i neopravdanu upotrebu antibiotika kod dece sa čestim respiratornim infekcijama gde bakterijsko učešće nije potvrđeno kulturama ili antibiogramima [9]. Randomizovana, dvostruko slepa studija sprovedena u osam američkih gradova, kako u ambulantnim uslovima, tako i u hitnim medicinskim centrima, istraživala je decu lečenu od nekomplikovane upale pluća. Ova studija je obuhvatila dve grupe subjekata, od kojih je jedna primila placebo (supstancu bez terapijskog dejstva) i pokazala je veoma značajan rezultat, što ukazuje na statistički značajne razlike između dece koja su lečena od upale pluća pet dana i onih koja su lečena deset dana. Ovo istraživanje je od velikog značaja za javno zdravlje iz preventivne perspektive, jer pokazuje koliko antibiotika se zapravo nepotrebno propisuje za ovu vrstu infekcije, čime se nanosi šteta mikrobioti subjekata i doprinosi globalnom razvoju multi-rezistentnih bakterijskih sojeva [10]. Statistički značajne razlike su primećene kod pacijenata koji su profilaktički primali ceftriakson u poređenju sa onima koji su hospitalizovani zbog pogoršanja bolesti jetre koji su primali placebo. Nije bilo razlike u učestalosti recidiva, infekcija, stope smrtnosti ili brojnih laboratorijskih parametara. Ceftriakson je moćan cefalosporin treće generacije. Iz ove studije možemo zaključiti da se rezistencija može razviti čak i na tako jake antibiotike ako se ne koriste na odgovarajući način [11]. Međutim, određene studije pokazuju sve veći broj pacijenata koji zloupotrebljavaju lekove i preparate za akutnu upalu grla i traže alternativne metode da se izleče bez stručnog saveta [12]. U meta-analizi sprovedenoj u cilju analize podataka u svrhu racionalne antibiotske profilakse kod stomatoloških pacijenata, dobijeni su poražavajući rezultati, što ukazuje na to da je na svakih 19 funkcionalno zdravih subjekata samo jedna osoba zaštićena od potencijalne

creasing the tendency of the microbiota to develop resistance to the given drug [6]. A double-blind, randomized study conducted over 6 months in 2019 showed significant results when comparing an inert substance to a drug from the penicillin derivatives group. Strict statistical indicators showed no significant differences between the two groups of subjects who received these substances after surgery. Here, public health concerns are paramount, as unconfirmed laboratory use of antibiotics poses a global threat due to the increasing prevalence of resistance, both in penicillin derivatives and in other groups of drugs [7]. A randomized controlled trial conducted in Hong Kong aimed to explore peer education through social networks, showing and confirming that education is the key to preventing the development of bacterial resistance to antibiotics [8]. Another randomized, double-blind study underscored the importance of communication between physicians and parents. Given that this communication is crucial, especially if the patients are children, proper heteroanamnesis significantly reduces the excessive and unwarranted use of antibiotics in children with frequent respiratory infections where bacterial involvement has not been confirmed by cultures or antibiograms [9]. A randomized, double-blind study conducted in eight U.S. cities, both in outpatient settings and in emergency care settings, investigated children treated for uncomplicated pneumonia. This study included two groups of subjects, one of which received a placebo (an inactive substance), and revealed highly significant results, showing statistically meaningful differences between children treated for pneumonia for five days and those treated for ten days. This research is of great importance to public health from a preventive perspective, as it highlights how many antibiotics are actually unnecessarily prescribed for this type of infection, thereby harming the subjects' microbiota and contributing to the global development of multi-resistant bacterial strains [10]. Statistically significant differences were observed among patients who received ceftriaxone prophylactically compared to those hospitalized for liver disease deterioration who received a placebo. No differences were noted in recurrence, infection rates, mortality, or numerous laboratory parameters. Ceftriaxone is a potent third-generation cephalosporin. From this study, we can conclude that resistance can develop even to such strong antibiotics if not used appropriately [11]. However, certain studies report an increasing number of patients misusing medications and preparations for acute pharyngitis, seeking alternative treatments without expert advice [12]. A meta-analysis aimed at evaluating data on rational antibiotic prophylaxis in dental patients yielded alarming results, showing that out of every 19 functionally healthy subjects, only one person is protected from potential in-

infekcije profilaktičkom upotrebom antibiotika. Ovo je alarmantan problem u stomatologiji, jer studija pokazuje da je 18 ljudi ostalo zdravo ali sa sigurno oštećenom mikrobiotom [13]. U indijskoj populaciji, između 5% i preko 30% pojedinaca koristi antibiotike bez lekarskih konsultacija, sa najvećom prevalencijom među korisnicima stomatoloških usluga. Ovo naglašava značajnu ulogu stomatologa i drugih zdravstvenih radnika u propisivanju antibiotika. Međutim, široko rasprostranjeno samoinicijativno uzimanje lekova u zemlji sa populacijom većom od 1 milijarde predstavlja kritičan izazov za kontrolu rezistencije na antibiotike [14]. Samoinicijativna upotreba antibiotika veliki je globalni problem javnog zdravlja, posebno u lečenju dece. Ovaj fenomen varira u zavisnosti od kulturnih, ekonomskih i društvenih faktora. Najčešći razlozi uključuju kupovinu antibiotika bez medicinskog nadzora i upotrebu ostataka lekova iz prethodnih recepata kada se simptomi ponove. Takve prakse pogoršavaju zloupotrebu antibiotika i razvoj rezistencije [15]. Samoinicijativna upotreba antibiotika je veoma česta praksa u Etiopiji. Ova meta-analička studija naglašava potrebu za ciljanom edukacijom usmerenom na različite ciljne grupe. Takva edukacija prvo treba da se bavi osnovnim znanjem o antibioticima, opasnostima samoinicijativnog lečenja i opasnostima od neadekvatne primene [16]. Određene studije identifikuju apoteke kao primarne izvore antibiotika za samolečenje. Ovo dodaje novu dimenziju krizi javnog zdravlja, jer neki farmaceuti izdaju antibiotike bez receptaa. Iako farmaceuti mogu pružiti informacije o antibioticima, to je nedovoljno bez sveobuhvatne medicinske procene od strane lekara. Pravilan izbor antibiotika zahteva kliničku procenu, analizu bakterijske kulture i druge relevantne dijagnostičke parametre [17]. Štaviše, određene studije pokazuju neopravdano davanje antibiotika deci. Ne samo da ovi tretmani ne olakšavaju oporavak, već doprinose i razvoju rezistencije na primenjene antibiotike, čime se pogoršava širi problem antimikrobne rezistencije [18].

Razvoj superbakterija povezan sa prekomernom upotrebom antibiotika

Da bi se smanjili negativni efekti antibiotika, sve više se istražuju alternativni pristupi, poput probiotika i prebiotika. Autor studije Duan i saradnici su pokazali da suplementacija ovim preparatima može ubrzati oporavak mikrobiote, čime se smanjuje rizik od posledica kao što je disbioza (neravnotežu u sastavu mikrobiote) [18]. Prekomerna upotreba antibiotika postala je značajan globalni problem sa dalekosežnim posledicama po ljudsko zdravlje. Jedan od najvažnijih aspekata ovog problema je poremećaj crevne mikrobiote, koja igra ključnu ulogu u održavanju imunološke funkcije, metabolizma i ho-

fection through prophylactic antibiotic use. This is an alarming problem in dentistry, as the study indicates that while 18 individuals remained healthy, their microbiota was likely harmed [13]. In the Indian population, between 5% and over 30% of individuals use antibiotics without medical consultation, with the highest prevalence among dental care users. This highlights the significant role of dentists and other healthcare professionals in antibiotic prescription. However, the widespread self-medication in a country with a population exceeding 1 billion poses a critical challenge for controlling antibiotic resistance [14]. Self-medication with antibiotics is also a major global public health issue, particularly in pediatric treatment. This phenomenon varies according to cultural, economic, and social factors. The most common reasons include purchasing antibiotics without medical oversight and using leftover medications from prior prescriptions when symptoms recur. These practices exacerbate the misuse of antibiotics and resistance development [15]. Self-initiated use of antibiotics is a widespread practice in Ethiopia. This meta-analytical study highlights the need for targeted education directed at various population groups. Such education should first address basic knowledge about antibiotics, the dangers of self-initiated treatment, and the dangers of inadequate application [16]. Certain studies identify pharmacies as the primary sources of antibiotics for self-medication. This adds a new dimension to the public health crisis, as some pharmacists dispense antibiotics without requiring prescriptions. While pharmacists may provide information about antibiotics, this is insufficient without a comprehensive medical evaluation by a physician. Proper antibiotic selection requires clinical assessment, bacterial culture analysis, and other relevant diagnostic parameters [17]. Furthermore, certain studies show the unjustified administration of antibiotics to children. Not only do these treatments fail to facilitate recovery, but they also contribute to the development of resistance to the administered antibiotics, thereby exacerbating the broader problem of antimicrobial resistance [18].

Development of superbugs associated with the overuse of antibiotics

To reduce the negative effects of antibiotics, alternatives such as probiotics and prebiotics are increasingly being researched. Duan et al. demonstrated that supplementation with these agents can accelerate the recovery of the microbiota, thereby reducing the risk of consequences such as dysbiosis (an imbalance in the composition of microbiota) [18]. The overuse of antibiotics has become a significant global problem with far-reaching consequences for human health. One of the most important aspects of this problem is the disruption of the intesti-

meostaze organizma. Dok antibiotici efikasno eliminišu patogene, njihova neselektivna akcija uništava komensalne bakterije, narušava delikatnu ravnotežu crevne mikrobiote i izaziva potencijalne zdravstvene komplikacije. Istraživanja pokazuju da antibiotska terapija može izazvati značajno smanjenje raznolikosti crevne mikrobiote, što rezultira smanjenom otpornošću na kolonizaciju patogenim mikroorganizmima. Autor Palleja i saradnici su u studiji dokumentovali da, kod odraslih, može potrajati nekoliko meseci da se mikrobiota oporavi nakon antibiotika, a određene bakterijske vrste mogu trajno nestati [19]. Slične nalaze pružaju u svojoj studiji autor Schwartz i saradnici, naglašavajući da poremećaji mikrobiote izazvani antibioticima imaju dugoročne posledice, uključujući povećanu osetljivost na infekcije i upalne procese [20]. Pored akutnih poremećaja, dugoročne posledice uključuju razvoj metaboličkih poremećaja, alergija i autoimunih bolesti. Konstantinidis i saradnici u svom istraživanju su naglasili da antibiotici mogu promijeniti metabolizam kratkolančanih masnih kiselina, koje su ključne za zdravlje crevne sluznice, čime se povećava rizik od inflamatornih bolesti creva [21]. Takođe, Lu i saradnici su pokazali u svom istraživanju da disbioza može narušiti integritet crevne barijere, omogućavajući toksinima i bakterijama da uđu u krvotok, što dovodi do sistemske upale [22]. Kod dece, čija se crevna mikrobiota još uvek razvija, antibiotici mogu izazvati trajne promene. McDonnell i autori su u svojoj studiji identifikovali korelaciju između ranog izlaganja antibioticima i povećanog rizika od astme i alergija [23]. Slično tome, istraživanje Patrick i saradnika pokazalo je da je smanjena raznolikost mikrobiota kod dece povezana sa imunološkom disregulacijom [24]. Prekomerna upotreba antibiotika ima značajne štetne efekte na crevnu mikrobiotu i opšte zdravlje. Neophodno je usmeriti napore na racionalizaciju njihove primene, edukaciju stanovništva i promociju upotrebe zaštitnih preparata, kao što su probiotici, kako bi se očuvala ravnoteža mikrobiote i smanjile dugoročne zdravstvene komplikacije. Rešavanje rezistencije na antibiotike zahteva multidisciplinarni pristup, uključujući obrazovanje, razvoj zdravstvenih politika i unapređenje dijagnostičkih metoda. Ključna komponenta prevencije je edukacija zdravstvenih radnika i pacijenata. Studije su pokazale da programi obuke za zdravstvene radnike, zasnovani na principima racionalne upotrebe antibiotika, značajno smanjuju nepravilno propisivanje. Dodatna briga i jedan od najvećih kliničkih izazova širom sveta je porast multirezistentnih infekcija (MDR), sa posebnim naglaskom na MDR tuberkulozu, koja pogađa oko 500.000 novih pacijenata godišnje. Najveće stope MDR-TB zabeležene su u Evropi, dok 87% novih slučajeva dolazi iz 30 zemalja Azije, Afrike i Latinske Amerike. Pored toga, patogeni iz grupe ESKAPE

nal mikrobiota, which plays a key role in maintaining the immune function, metabolism, and homeostasis of the organism. While antibiotics effectively eliminate pathogens, their indiscriminate action destroys commensal bacteria, disrupting the delicate balance of gut microbiota and causing potential health complications. Research shows that antibiotic therapy can cause a significant reduction in the diversity of intestinal microbiota, resulting in decreased resistance to colonization by pathogenic microorganisms. Palleja et al. documented in their study that, in adults, it may take several months for the microbiota to recover after antibiotics, and certain bacterial species may disappear permanently [19]. Similar findings were reported by Schwartz et al., emphasizing that antibiotic-induced disturbances of the microbiota have long-term consequences, including increased susceptibility to infections and inflammatory processes [20]. In addition to acute disorders, long-term consequences include the development of metabolic disorders, allergies, and autoimmune diseases. Konstantinidis et al. highlighted in their study that antibiotics can alter the metabolism of short-chain fatty acids, which are crucial for the health of the intestinal mucosa, thereby increasing the risk of inflammatory bowel diseases [21]. Also, Lu et al. showed that dysbiosis can impair the integrity of the intestinal barrier, allowing toxins and bacteria to enter the bloodstream, leading to systemic inflammation [22]. In children, whose gut microbiota is still developing, antibiotics can cause permanent changes. McDonnell et al. identified a correlation between early exposure to antibiotics and an increased risk of asthma and allergies [23]. Similarly, research by Patrick et al. demonstrated that reduced microbiota diversity in children is associated with immune dysregulation [24]. The excessive use of antibiotics has significant detrimental effects on gut microbiota and general health. Efforts must be directed towards rationalizing their use, educating the population, and promoting protective interventions, such as probiotics, to preserve the balance of microbiota and reduce long-term health complications. Addressing antibiotic resistance requires a multidisciplinary approach, including education, the development of health policies, and the improvement of diagnostic methods. A key component of prevention is the education of healthcare workers and patients. Studies have shown that training programs for healthcare workers on principles of rational antibiotic use significantly reduce improper prescribing. An additional concern and one of the biggest clinical challenges worldwide is the rise of multidrug-resistant infections (MDR), with a special emphasis on MDR tuberculosis, which affects about 500,000 new patients annually. The highest rates of MDR-TB are recorded in Europe, while 87% of new cases come from 30 countries in Asia,

(*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* i *Enterobacter* vrste) značajno doprinose globalnom teretu rezistencije na antibiotike [25]. Edukacija pacijenata o rizicima povezanim sa samopropisanom upotrebom antibiotika i njihovom neadekvatnom upotrebom može imati dugoročni uticaj na smanjenje rezistencije [26]. Uvođenje naprednih dijagnostičkih alata, kao što su brzi testovi za identifikaciju bakterijskih infekcija i određivanje osetljivosti na antibiotike, može doprineti preciznijem propisivanju lekova i smanjenju nepotrebne primene [27]. Pored toga, globalne inicijative, kao što su regulacija dostupnosti antibiotika bez recepta, kontrolisana distribucija i razvoj novih antimikrobnih lekova, od suštinskog su značaja za borbu protiv ovog sve ozbiljnog problema javnog zdravlja [28]. Preventivne mere, kao što su vakcinacija i poboljšana higijena, takođe mogu doprineti smanjenju potrebe za antibioticima i sprečavanju razvoja rezistencije. Konačno, u razmatranju antimikrobne rezistencije (AMR) važno je prepoznati da ona predstavlja složen i hitan globalni izazov, dodatno pogoršan promenama koje je izazvala pandemija COVID-19. Pored kliničkih okruženja, faktori životne sredine kao što su nekontrolisano ispuštanje otpada, agrohemijaska upotreba i migracija divljih životinja takođe doprinose širenju AMR-a, što naglašava potrebu za integrisanim pristupom rešavanju ovog problema [29].

Antimikrobna rezistencija: globalna zdravstvena kriza

Mikroorganizmi, uključujući različite bakterijske populacije u gastrointestinalnom traktu čoveka, igraju ključnu ulogu u održavanju opšteg zdravlja. Kada se antibiotici prekomerno koriste, oni uništavaju ne samo patogene bakterije, već i korisne mikroorganizme, stvarajući uslove za razvoj "superbakterija" – bakterija koje su otporne na više antibiotika. Ove bakterije mogu izazvati teže infekcije koje je znatno teže izlečiti, čime se ugrožava zdravlje pacijenata. Antimikrobna rezistencija postala je globalna zdravstvena kriza pojavom bakterija rezistentnih na više lekova koje se ne mogu lečiti standardnim antibioticima. Na primer, novi sojevi *Neisseria gonorrhoeae* otporni na karbapeneme treće generacije izazvali su neizlečive infekcije gonoreje u Velikoj Britaniji. Iako su uložena značajna sredstva, razvoj novih antibiotika koji mogu prevazići ovu otpornost napreduje presporo [30]. Studije su pokazale da su pacijenti koji su preterano koristili antibiotike podložniji infekcijama izazvanim sojevima rezistentnim na više lekova, kao što je *Clostridioides difficile* (*C. difficile*), koji je obično prisutan u bolnicama, ali postaje smrtonosna pretnja u okruženju disbioze izazvane antibioticima. Upotreba antibiotika može imati nekoliko negativnih

Africa, and Latin America. Additionally, pathogens from the ESKAPE group (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter* species) contribute significantly to the global burden of antibiotic resistance [25]. Educating patients about the risks associated with self-prescribed antibiotic use and their inadequate use can have a long-term impact on reducing resistance [26]. The introduction of advanced diagnostic tools, such as rapid tests for the identification of bacterial infections and determination of sensitivity to antibiotics, can contribute to more accurate prescribing of drugs and reduction of unnecessary administration [27]. In addition, global initiatives, such as regulation of over-the-counter antibiotic availability, controlled distribution, and development of new antimicrobial drugs, are essential to combat this increasingly serious public health problem [28]. Preventive measures, such as vaccination and improved hygiene, can also contribute to reducing the need for antibiotics and preventing the development of resistance. Finally, in considering antimicrobial resistance (AMR), it is important to recognize that it represents a complex and urgent global challenge, further exacerbated by the changes brought about by the COVID-19 pandemic. In addition to clinical settings, environmental factors such as uncontrolled waste discharge, agrochemical use, and wildlife migration also contribute to the spread of AMR, which highlights the need for an integrated approach to addressing this problem [29].

Antimicrobial resistance: A global health crisis

Microorganisms, including the diverse bacterial populations within the human gut, play a key role in maintaining overall health. When antibiotics are overused, they destroy not only pathogenic bacteria but also beneficial microorganisms, creating conditions for the development of "superbugs" – bacteria that are resistant to multiple antibiotics. These bacteria can cause more severe infections that are much more difficult to treat, thereby endangering patient outcomes. Antimicrobial resistance has become a global health crisis with the emergence of multidrug-resistant bacteria that cannot be treated with standard antibiotics. For example, new strains of *Neisseria gonorrhoeae* resistant to third-generation carbapenems have caused untreatable gonorrhea infections in the United Kingdom. Although considerable resources have been invested, the development of new antibiotics that can overcome this resistance is progressing too slowly [30]. Studies have shown that patients who have overused antibiotics are more susceptible to infections caused by multidrug-resistant strains, such as *Clostridioides difficile* (*C. difficile*), which is commonly present in hospitals but becomes a deadly

efekata na crevnu mikrobiotu, uključujući smanjenu raznolikost vrsta, izmenjenu metaboličku aktivnost i selekciju organizama otpornih na antibiotike, što za uzvrat može dovesti do dijareje povezane sa antibiotici i rekurentnih infekcija *Clostridioides difficile*. Rano izlaganje antibioticima tokom detinjstva takođe je povezano sa gastrointestinalnim poremećajima, imunološkom disregulacijom i neurokognitivnim oštećenjima. Rastući trend potrošnje antibiotika u poslednjih nekoliko godina sugerise da će se ovi izazovi verovatno intenzivirati u budućnosti [31]. Novi antibiotici su ključni za borbu protiv društvenih izazova koje predstavlja *Staphylococcus aureus* (MRSA) rezistentna na meticilin, gram-pozitivna bakterija odgovorna za ozbiljne infekcije širom sveta. Studija grupe istraživača iz Amerike i Egipta otkrila je novi derivat tetracena - Mersahinone, izolovan iz kulture morskog aktinomiceta *Streptomyces* sp. EG1, pronađenog u sedimentima severne obale Sredozemnog mora u Egiptu. Ovi nalazi potvrđuju potencijal morskih aktinomiceta kao izvora novih bioaktivnih jedinjenja, posebno u relativno neistraženim područjima kao što je Sredozemno more. Buduće studije mogu dodatno iskoristiti biodiverzitet ovog regiona za razvoj obećavajućih antimikrobnih sredstava [32]. Antimikrobna rezistencija, posebno kod bakterija, predstavlja jedan od najvažnijih izazova savremene medicine. Uprkos hitnoj potrebi za novim antibioticima, napredak u njihovom razvoju je spor, dok otpornost na postojeće lekove nastavlja da raste. Potrebna su značajna ulaganja u istraživanje i razvoj kako bi se što pre pronašle efikasne strategije za borbu protiv ove globalne pretnje javnom zdravlju. Važno je napomenuti da je razvoj bakterija otpornih na antibiotike globalni problem koji zahteva koordinirane napore u kontroli upotrebe antibiotika, kao i u istraživanju novih terapijskih opcija i strategija, ne samo za pojedinca, već i za životnu sredinu u celini [33]. Edukacija zdravstvenih radnika i pacijenata o pravilnoj upotrebi antibiotika je od ključnog značaja za smanjenje rizika od razvoja rezistentnih sojeva i očuvanje efikasnosti postojećih terapija. Prekomerna i nepotrebna upotreba antibiotika ima značajan uticaj na mikrobiotu ljudskog organizma i doprinosi razvoju superbakterija. Ove bakterije predstavljaju ozbiljan izazov za javno zdravlje i neophodno je preduzeti odgovarajuće mere za kontrolu njihove pojave i širenja [30,33].

Strategije prevencije prekomerne upotrebe antibiotika

Antimikrobna rezistencija predstavlja kritičan globalni izazov javnog zdravlja. Aktuelne preventivne zdravstvene strategije su sve više usredsređene na strogu regulaciju prakse propisivanja antibiotika, ne samo među lekarima, već i u stomatološkoj praksi [25,26]. Štaviše, primena

threat in the setting of antibiotic-induced dysbiosis. Antibiotic use can have several adverse effects on the gut microbiota, including reduced species diversity, altered metabolic activity, and selection of antibiotic-resistant organisms, which in turn can lead to antibiotic-associated diarrhea and recurrent *Clostridioides difficile* infections. Early exposure to antibiotics during childhood has also been linked to gastrointestinal disorders, immune dysregulation, and neurocognitive impairments. The increasing trend in antibiotic consumption in recent years suggests that these challenges will likely intensify in the future [31]. New antibiotics are key to combating the societal challenges posed by methicillin-resistant *Staphylococcus aureus* (MRSA), a gram-positive bacterium responsible for severe infections worldwide. A study by a group of researchers from America and Egypt discovered a new tetracene derivative, Mersahinone, isolated from a culture of the marine actinomycete *Streptomyces* sp. EG1, found in the sediments of the northern coast of the Mediterranean Sea in Egypt. These findings confirm the potential of marine actinomycetes as a source of new bioactive compounds, especially in relatively unexplored areas such as the Mediterranean Sea. Future studies may further exploit the biodiversity of this region to develop promising antimicrobial agents [32]. Antimicrobial resistance, especially in bacteria, represents one of the most important challenges of modern medicine. Despite the urgent need for new antibiotics, progress in their development is slow, while resistance to existing drugs continues to increase. Significant investment in research and development is needed to find effective strategies to combat this global threat to public health as soon as possible. It is important to note that the development of antibiotic-resistant bacteria is a global problem that requires coordinated efforts in controlling the use of antibiotics, as well as in the research of new therapeutic options and strategies, not only for the individual but also for the environment as a whole [33]. Educating healthcare workers and patients about the proper use of antibiotics is crucial to reducing the risk of developing resistant strains and preserving the efficacy of existing therapies. Excessive and unnecessary use of antibiotics has a significant impact on the microbiota of the human body and contributes to the development of superbugs. These bacteria represent a serious challenge to public health, and it is necessary to take appropriate measures to control their occurrence and spread [30,33].

Strategies for Preventing the Overuse of Antibiotics

Antimicrobial resistance represents a critical global public health challenge. Current preventive health strategies are increasingly focused on strict regulation

strožih zakonskih mera za suzbijanje neovlašćene prodaje i kupovine antibiotika mogla bi značajno smanjiti zloupotrebu antimikrobnih sredstava i napredovanje bakterijske rezistencije [25,26]. Kampanje javnog zdravlja igraju vitalnu ulogu u smanjenju osetljivosti na infekciju različitim bakterijskim sojevima [33]. Ove inicijative, uz promociju pravilne higijene ruku i tela, podstiču zdrave životne prakse kao što su uravnotežena ishrana i adekvatan unos esencijalnih mikronutrijenata [34–38].

Poseban naglasak treba staviti na antioksidativne vitamine, uključujući retinol, tokoferol i L-askorbinsku kiselinu, koji bi mogli smanjiti potrebu za antibiotici, posebno uz doprinos vitamina D, za koji se zna da stimuliše imuni sistem. Vitamini su biološki esencijalna organska jedinjenja široko klasifikovana u dve glavne grupe: vitamini rastvorljivi u mastima i vitamini rastvorljivi u vodi. Oni igraju ključnu ulogu u rastu, razvoju i ukupnoj psihološkoj funkciji organizma. Primarna funkcija određenih vitamina je njihova antioksidativna aktivnost, koja pomaže u sprečavanju endogene supresije imunih odgovora [34]. Vitamin A je snažan antioksidans koji štiti ćelijske membrane od oštećenja uzrokovanih slobodnim radikalima i sprečava međustanična oštećenja. Zbog svoje sposobnosti vezivanja proteina, vitamin A ostaje aktivan u citoplazmi, gde ovi povezani proteini olakšavaju njegov antioksidativni efekat čak i u vodenj sredini [35]. Još jedan antioksidant rastvorljiv u mastima, poznat kao “vitamin mladosti”, je vitamin E. Ovaj vitamin se integriše u ćelijske membrane, pružajući značajnu zaštitu od oštećenja izazvanih slobodnim radikalima. Značajno smanjuje broj slobodnih radikala koji dolaze u kontakt sa ćelijskim membranama [36]. Među vitaminima rastvorljivim u vodi, vitamin C, u svom aktivnom obliku L-askorbinska kiselina, pokazuje snažnu sposobnost da neutrališe slobodne radikale. Pored toga, igra ključnu ulogu u regeneraciji vitamina A i E nazad u njihove aktivne oblike [37]. Vitamin D, još jedan vitamin rastvorljiv u mastima, jedinstveno poseduje antikancerogena svojstva među vitaminima. Bitno je naglasiti da vitamin D nije antioksidant, međutim, njegov klinički značaj leži u njegovoj sposobnosti da poremeti funkciju membrane određenih malignih ćelija. Vitamin D stupa u interakciju sa receptorima smrti u jezgru ćelija raka, čime se indukuje apoptoza. Pored toga, vitamin D učestvuje u prevenciji citokinskih oluja, pojačava ćelijski imuni odgovor i podržava sazrevanje T-limfocita [38]. Pored toga, važno je naglasiti da, iako su određeni vitamini klasifikovani i regulisani kao lekovi, većina je dostupna u obliku suplemenata. Naime, nedostatak vitamina D povezan je sa značajnom imunološkom disregulacijom, pored prethodno pomenutih efekata [39]. Obogaćivanje određene hrane i pića vitaminima takođe može dovesti do smanjenog imunološkog odgovora na

of antibiotic prescribing practices, not only among physicians but also in dental practice [25,26]. Moreover, the implementation of more stringent legal measures to curb the unauthorized sale and purchase of antibiotics could significantly reduce the misuse of antimicrobial agents and the progression of bacterial resistance [25,26]. Public health campaigns play a vital role in reducing susceptibility to infections caused by various bacterial strains [33]. These initiatives, along with the promotion of proper hand and body hygiene, encourage healthy lifestyle practices such as a balanced diet and adequate intake of essential micronutrients [34–38].

Particular emphasis should be placed on antioxidant vitamins, including retinol, tocopherol, and L-ascorbic acid, which may reduce the need for antibiotics, especially with the contribution of vitamin D, known to stimulate the immune system. Vitamins are biologically essential organic compounds broadly classified into two major groups: fat-soluble and water-soluble vitamins. They play a crucial role in the growth, development, and overall psychological function of the organism. The primary function of certain vitamins is their antioxidant activity, which helps prevent endogenous suppression of immune responses [34]. Vitamin A is a potent antioxidant that protects cellular membranes from damage caused by free radicals and prevents intercellular damage. Due to its protein-binding capacity, vitamin A remains active within the cytoplasm, where these associated proteins facilitate its antioxidant effect even in an aqueous environment [35]. Another fat-soluble antioxidant, known as the “youth vitamin”, is vitamin E. This vitamin integrates into the cell membranes, providing substantial protection against free radical-induced damage. It significantly reduces the number of free radicals that come into contact with cellular membranes [36]. Among the water-soluble vitamins, vitamin C, in its active form, L-ascorbic acid, exhibits a powerful capacity to neutralize free radicals. Additionally, it plays a crucial role in regenerating vitamins A and E back to their active forms [37]. Vitamin D, another fat-soluble vitamin, uniquely possesses anti-cancer properties among vitamins. It is essential to highlight that vitamin D is not an antioxidant; however, its clinical significance lies in its ability to disrupt the membrane function of specific malignant cells. Vitamin D interacts with death receptors within the nucleus of cancer cells, thereby inducing apoptosis. Additionally, vitamin D participates in the prevention of cytokine storms, enhances cellular immune responses, and supports the maturation of T-lymphocytes [38]. Additionally, it is essential to emphasize that while specific vitamins are classified and regulated as medicine, the

bakterijske patogene, čime se smanjuje potreba za antibiotskom terapijom. Nova antimikrobna sredstva, kao što je fidaxomicin, član klase makrolida, su od posebnog značaja u lečenju infekcija *Clostridium difficile*. Ovaj patogen reaguje na samo tri antibiotika a otpornost na te agense se povećava. Stoga, uključivanje fidaxomicina u terapijske režime igra ključnu ulogu u lečenju ove infekcije [21]. Sve ove mere sa preventivnim javnozdravstvenim strategijama mogu značajno smanjiti bakterijske infekcije, a samim tim i upotrebu antibiotika.

Preporuke Saveta Evropske unije u borbi protiv antimikrobne rezistencije

Savet Evropske unije je 2023. godine usvojio preporuke za unapređenje borbe protiv antimikrobne rezistencije (AMR), zasnovane na konceptu *One Health*, koji integriše zdravlje ljudi, životinja i životne sredine. Preporuke uključuju izradu ili ažuriranje nacionalnih akcionih planova, jačanje sistema nadzora nad potrošnjom antibiotika i praćenjem rezistencije, unapređenje mera prevencije i kontrole infekcija, te sprovođenje programa racionalne upotrebe antibiotika u svim sektorima.

Posebni ciljevi do 2030. godine obuhvataju smanjenje ukupne potrošnje antibiotika za 20% u odnosu na 2019. godinu, povećanje udela antibiotika iz WHO kategorije „Access“ na najmanje 65%, smanjenje učestalosti bakterijskih infekcija rezistentnih na antibiotike, te smanjenje prodaje antimikrobnih sredstava za životinje i akvakulturu za 50%. Preporuke naglašavaju i značaj kontinuirane edukacije zdravstvenih radnika i javnosti, ulaganje u istraživanje i razvoj novih terapijskih pristupa, dijagnostičkih metoda i vakcina, kao i jačanje međunarodne saradnje [40].

ZAKLJUČAK

AMR predstavlja značajan izazov za javno zdravlje, koji svake godine čini više od 35.000 smrtnih slučajeva u Evropskoj uniji i Evropskom ekonomskom prostoru (EU / EEA). Hitnu potrebu za efikasnim merama za borbu protiv AMR-a nameće značajan finansijski pritisak zdravstvenim sistemima. Ekonomske implikacije uključuju veće troškove zbog produženog boravka u bolnici, upotreba skupljih lekova i potreba za dodatnim medicinskim procedurama. Kako stope otpornosti eskaliraju, efikasnost standardnih tretmana opada, komplikuje upravljanje pacijentima i povećava učestalost infekcija otpornih na lečenje. Još mnogo treba uraditi na polju rešavanja AMR-za poboljšanje zdravstvenih ishoda, i za očuvanje održivosti zdravstvenih resursa širom Evrope.

Sukob interesa: Nije prijavljen.

majority are available as supplements. Notably, vitamin D deficiency is associated with significant immune dysregulation, in addition to the previously mentioned effects [39]. Enriching certain foods and beverages with vitamins may also lead to a reduced immune response to bacterial pathogens, thereby lowering the need for antibiotic therapy. New antimicrobial agents, such as fidaxomicin, a member of the macrolide class, are of particular importance in the treatment of *Clostridium difficile* infections. This pathogen responds to only three antibiotics, and resistance to these agents is increasing. Therefore, the inclusion of fidaxomicin in therapeutic regimens plays a key role in treating this infection [21]. All these measures, combined with preventive public health strategies, can significantly reduce bacterial infections and, consequently, the use of antibiotics.

Recommendations of the Council of the European Union on Combating Antimicrobial Resistance

In 2023, the Council of the European Union adopted recommendations to strengthen the fight against antimicrobial resistance (AMR), based on the *One Health* concept, which integrates human, animal, and environmental health. The recommendations include developing or updating national action plans, strengthening surveillance systems for antibiotic consumption and resistance monitoring, improving infection prevention and control measures, and implementing antibiotic stewardship programs across all sectors.

Specific targets for 2030 include reducing overall antibiotic consumption by 20% compared to 2019, increasing the proportion of antibiotics from the WHO „Access“ category to at least 65%, reducing the incidence of antibiotic-resistant bacterial infections, and reducing antimicrobial sales for animals and aquaculture by 50%. The recommendations also emphasize the importance of continuous education for healthcare professionals and the public, investment in research and development of new therapeutic approaches, diagnostic methods, and vaccines, as well as strengthening international cooperation [40].

CONCLUSION

AMR represents a significant public health challenge, causing more than 35,000 deaths annually in the European Union and the European Economic Area (EU/EEA). The urgent need for effective measures to combat AMR is underscored by the significant financial burden it places on healthcare systems. Economic implications include higher costs due to prolonged hospital stays, the use of more expensive medicines, and the need for additional medical procedures. As resistance rates

LITERATURA / REFERENCES

- Baran A, Kwiatkowska A, Potocki L. Antibiotics and bacterial resistance—a short story of an endless arms race. *Int J Mol Sci*. 2023 Mar 17;24(6):5777. doi: 10.3390/ijms24065777.
- Muteeb G, Rehman MT, Shahwan M, Aatif M. Origin of antibiotics and antibiotic resistance, and their impacts on drug development: a narrative review. *Pharmaceuticals* (Basel). 2023 Nov 15;16(11):1615. doi: 10.3390/ph16111615.
- Tang KWK, Millar BC, Moore JE. Antimicrobial resistance (AMR). *Br J Biomed Sci*. 2023 Jun 28; 80:11387. doi: 10.3389/bjbs.2023.11387.
- Koprivica M, Đekić Malbaša J. Epidemiološke karakteristike infekcija izazvanih toksinima bakterije *Clostridioides difficile*. *Srp Arh Celok Lek.* 2024;152(9-10):505-8. doi: 10.2298/SARH240625077K.
- Goggin K, Hurley EA, Lee BR, Bradley-Ewing A, Bickford C, Pina K, et al. Let's talk about antibiotics: a randomised trial of two interventions to reduce antibiotic misuse. *BMJ Open*. 2022 Nov 21;12(11):e049258. doi: 10.1136/bmjopen-2021-049258.
- Serena TE, Gould L, Ousey K, Kirsner RS. Reliance on clinical signs and symptoms assessment leads to misuse of antimicrobials: post hoc analysis of 350 chronic wounds. *Adv Wound Care* (New Rochelle). 2022 Dec;11(12):639-49. doi: 10.1089/wound.2021.0146.
- Katundu D, Chussi D, Nyombi B, Philemon R, Semvua H, Hannink G, et al. Effect of placebo versus prophylactic postoperative amoxicillin on post-(adeno) tonsillectomy morbidity in Tanzanian children: a two-centre, double-blind randomized controlled non-inferiority trial. *Pan Afr Med J*. 2022 Jun 22;42:142. doi: 10.11604/pamj.2022.42.142.35540.
- Or PL, Ching TY. The effectiveness of raising Hong Kong parents' awareness of antimicrobial resistance through an education program with peer support on social media: a randomized, controlled pilot study. *BMC Public Health*. 2022 Feb 15;22(1):315. doi: 10.1186/s12889-022-12697-w.
- Goggin K, Bradley-Ewing A, Myers AL, Lee BR, Hurley EA, Delay KB, et al. Protocol for a randomised trial of higher versus lower intensity patient-provider communication interventions to reduce antibiotic misuse in two paediatric ambulatory clinics in the USA. *BMJ Open*. 2018 May 9;8(5):e020981. doi: 10.1136/bmjopen-2017-020981.
- Williams DJ, Creech CB, Walter EB, Martin JM, Gerber JS, Newland JG, et al. Short- vs standard-course outpatient antibiotic therapy for community-acquired pneumonia in children: the SCOUT-CAP randomized clinical trial. *JAMA Pediatr*. 2022 Mar 1;176(3):253-61. doi: 10.1001/jamapediatrics.2021.5547.
- Fricker Z, Jiang G, Patel H, McLaughlin A, Izunza Barba S, Niezen S, et al. A randomized study of ceftriaxone for the prevention of infections in hospitalized patients with advanced cirrhosis. *Hepatol Commun*. 2024 Jan 5;8(1):e0356. doi: 10.1097/HC9.0000000000000356.
- McNally D, Simpson M, Morris C, Shephard A, Goulder M. Rapid relief of acute sore throat with AMC/DCBA throat lozenges: randomised controlled trial. *Int J Clin Pract*. 2010 Jan;64(2):194-207. doi: 10.1111/j.1742-1241.2009.02230.x.
- Lodi G, Azzi L, Varoni EM, Pentenero M, Del Fabbro M, Carrassi A, et al. Antibiotics to prevent complications following tooth extractions. *Cochrane Database Syst Rev*. 2021 Feb 24;2(2):CD003811. doi: 10.1002/14651858.CD003811.pub3.
- Bhuvaraghan A, King R, Larvin H, Aggarwal VR. Antibiotic use and misuse in dentistry in India: a systematic review. *Antibiotics* (Basel). 2021 Nov 26;10(12):1459. doi: 10.3390/antibiotics10121459.
- Bert F, Previti C, Calabrese F, Scaioli G, Siliquini R. Antibiotics self-medication among children: a systematic review. *Antibiotics* (Basel). 2022 Nov 9;11(11):1583. doi: 10.3390/antibiotics11111583.
- Bi B, Qin J, Zhang L, Lin C, Li S, Zhang Y. Systematic review and meta-analysis of factors influencing self-medication in children. *Inquiry*. 2023 Jan-Dec;60:469580231159744. doi: 10.1177/00469580231159744.
- Almohammed RA, Bird EL. Public knowledge and behaviours relating to antibiotic use in Gulf Cooperation Council countries: a systematic review. *J Infect Public Health*. 2019 Mar-Apr;12(2):159-66. doi: 10.1016/j.jiph.2018.09.002.
- Duan L, Lin R, Wang D, Wang X, Zhang X, Ding L, et al. Eliciting parents' decision-making to antibiotic use for upper respiratory tract infections: A discrete choice experiment. *J Glob Health*. 2024 Dec 9;14:04220. doi: 10.7189/jogh.14.04220.
- Palleja A, Mikkelsen KH, Forslund SK, Kashani A, Allin KH, Nielsen T, et al. Recovery of gut microbiota of healthy adults following antibiotic exposure. *Nat Microbiol*. 2018 Nov;3(11):1255-65. doi: 10.1038/s41564-018-0257-9.
- Schwartz DJ, Langdon AE, Dantas G. Understanding the impact of antibiotic perturbation on the human microbiome. *Genome Med*. 2020 Sep 28;12(1):82. doi: 10.1186/s13073-020-00782-x.
- Konstantinidis T, Tsigalou C, Karvelas A, Stavropoulou E, Voidarou C, Be-zirtzoglou E. Effects of Antibiotics upon the Gut Microbiome: A Review of the Literature. *Biomedicines*. 2020 Nov 16;8(11):502. doi: 10.3390/biomedicines8110502.
- Duan H, Yu L, Tian F, Zhai Q, Fan L, Chen W. Antibiotic-induced gut dysbiosis and barrier disruption and the potential protective strategies. *Crit Rev Food Sci Nutr*. 2022;62(6):1427-52. doi: 10.1080/10408398.2020.1843396.
- McDonnell L, Gilkes A, Ashworth M, Rowland V, Harries TH, Armstrong D, et al. Association between antibiotics and gut microbiome dysbiosis in children: systematic review and meta-analysis. *Gut Microbes*. 2021 Jan-Dec;13(1):1-18. doi: 10.1080/19490976.2020.1870402.
- Patrick DM, Sbihi H, Dai DLY, Al Mamun A, Rasali D, Rose C, et al. Decreasing antibiotic use, the gut microbiota, and asthma incidence in children. *Lancet Respir Med*. 2020 Nov;8(11):1094-105. doi: 10.1016/S2213-2600(20)30052-7.
- Majumder MAA, Rahman S, Cohall D, Bharatha A, Singh K, Haque M, et al. Antimicrobial stewardship: fighting antimicrobial resistance and protecting global public health. *Infect Drug Resist*. 2020 Dec 29;13:4713-38. doi: 10.2147/IDR.S290835.

escalate, the effectiveness of standard treatments declines, complicating patient management and increasing the incidence of hard-to-treat infections. Much more needs to be done to address AMR to improve health outcomes and to preserve the sustainability of healthcare resources across Europe.

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26. Rajput A. Examining the implementation and effectiveness of antibiotic stewardship programs in healthcare settings to prevent antibiotic resistance and promote prudent antibiotic use. *Knowl Res.* 2023 Jun 30;1(11):11-24. doi: 10.57067/kr.v1i11.95.
27. Theodorakis N, Feretzakis G, Hitas C, Kreouzi M, Kalantzi S, Spyridaki A, et al. Antibiotic resistance in the elderly: mechanisms, risk factors, and solutions. *Microorganisms.* 2024 Sep 30;12(10):1978. doi: 10.3390/microorganisms12101978.
28. World Health Organization [Internet]. Antimicrobial resistance and the United Nations sustainable development cooperation framework: guidance for United Nations country teams. Geneva: WHO. 2021 [cited 2025 Jun 13]. Available from: <https://books.google.com/books?id=k3dyEAAQBAJ>
29. Arnold KE, Laing G, McMahon BJ, Fanning S, Stekel DJ, Pahl O, et al. The need for One Health systems-thinking approaches to understand multiscale dissemination of antimicrobial resistance. *Lancet Planet Health.* 2024 Feb;8(2):e124-33. doi: 10.1016/S2542-5196(23)00278-4.
30. Gray DA, Wenzel M. Multitarget approaches against multiresistant superbugs. *ACS Infect Dis.* 2020 Jun 12;6(6):1346-65. doi: 10.1021/acsinfectdis.0c00001.
31. Ramirez J, Guarner F, Bustos Fernandez L, Maruy A, Sdepanian VL, Cohen H. Antibiotics as major disruptors of gut microbiota. *Front Cell Infect Microbiol.* 2020 Nov 24;10:572912. doi: 10.3389/fcimb.2020.572912.
32. Kim MC, Cullum R, Hebishy AMS, Mohamed HA, Faraag AH, Salah NM, et al. Mersaquinone, a new tetracene derivative from the marine-derived *Streptomyces* sp. EG1 exhibiting activity against methicillin-resistant *Staphylococcus aureus* (MRSA). *Antibiotics (Basel).* 2020 May 14;9(5):252. doi: 10.3390/antibiotics9050252.
33. Mitchell J, Cooke P, Ahorlu C, Arjyal A, Baral S, Carter L, et al. Community engagement: the key to tackling antimicrobial resistance (AMR) across a One Health context? *Glob Public Health.* 2022 Nov;17(11):2647-64. doi: 10.1080/17441692.2021.2003839.
34. Koprivica M, Bjelanović J. Hipervitaminoza B12. *Med Čas.* 2021;55(4):139-43. doi: 10.5937/mckg55-33665.
35. Koprivica M, Bjelanović J. Značaj vitamina A u ishrani. *Med Čas.* 2021;55(3):99-103. doi: 10.5937/mckg55-31633.
36. Koprivica M, Miljković A. Uticaj vitamina E na različite organske sisteme. *Sanamed.* 2024;19(2):215-9. doi: 10.5937/sanamed0-49398.
37. Hemilä H, Chalker E. Vitamin C reduces the severity of common colds: a meta-analysis. *BMC Public Health.* 2023 Dec 11;23(1):2468. doi: 10.1186/s12889-023-17229-8.
38. Koprivica M, Kašiković Lečić S. Uzroci, posledice i lečenje nedostatka vitamina D kod ljudi. *Med Čas.* 2023;57(3):119-24. doi: 10.5937/mckg57-43860.
39. Koprivica M, Miljković A. Javnozdravstveni aspekti vitamina D. *Srp Arh Celok Lek.* 2025;153(1-2):103-6. doi: 10.2298/SARH241123012K.
40. Council of the European Union. Council recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach. *Off J Eur Union [Internet].* 2023 Jun 22 [cited 2025 Jun 13];60(C220/1):6-9. Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.C_.2023.220.01.0001.01.ENG&toc=OJ%3A-C%3A2023%3A220%3ATOC

PRVIH PET GODINA „SRPSKOG MEDICINSKOG ČASOPISA LEKARSKE KOMORE“ – SAŽET PREGLED I ANALIZA

PREGLEDNI RAD

REVIEW ARTICLE

THE FIRST FIVE YEARS OF THE SERBIAN JOURNAL OF THE MEDICAL CHAMBER – A BRIEF OVERVIEW AND ANALYSIS

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SAŽETAK

Rad predstavlja sažeti osvrt na prvih pet godina objavljivanja „Srpskog medicinskog časopisa Lekarske komore“. Cilj rada jeste da upozna čitaoca sa Časopisom u kontekstu drugih nacionalnih medicinskih publikacija i da prezentuje konciznu analizu različitih vrsta radova i tema pokrivenih u dosadašnjim brojevima Časopisa, čime se daje uvid u ono što Časopis pruža i čitaocima i autorima.

Ključne reči: „Srpski medicinski časopis Lekarske komore“, pet godina objavljivanja, osvrt

ABSTRACT

This is a brief overview of the *Serbian Journal of the Medical Chamber*, marking its fifth anniversary. It aims to inform the reader about the Journal in the context of other Serbian medical publications and present a concise analysis of the types of articles published and the topics covered to date, thus providing insight into what the Journal offers to both readers and authors.

Keywords: *Serbian Journal of the Medical Chamber*, fifth anniversary, overview

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UVOD

Lista kategorisanih naučnih časopisa domaćih izdavača za 2024. godinu, koju je objavilo Ministarstvo nauke, tehnološkog razvoja i inovacija Republike Srbije, pokazuje da postoji ukupno 44 časopisa domaćih izdavača koji spadaju u kategoriju medicinskih nauka. Od tog broja, četiri časopisa – *Acta Veterinaria*, *Journal of Medical Biochemistry*, „Srpski arhiv za celokupno lekarstvo“ i „Vojnosanitetski pregled“ – indeksirana su u bazi *Web of Science* (SCI-E, SSCI, AHCI) i u *Journal Citation Reports* (JCR) [1]. Preostalih četrdeset vode se kao domaći časopisi [1]. Većina pomenutih časopisa objavljuje radove na engleskom ili srpskom jeziku (sa naslovima i apstraktima na oba jezika); neki se objavljuju isključivo na engleskom jeziku ili isključivo na srpskom jeziku, dok devet časopisa objavljuje radove na oba jezika [1–45]. Najstariji medicinski časopis u Srbiji je *Srpski arhiv za celokupno lekarstvo*, prvi put objavljen 1872. godine [4].

Dok mnoge domaće medicinske publikacije (npr. „Glasnik javnog zdravlja“, koji izdaje Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“) imaju dugu tradiciju i izlaze već više decenija, neke su relativno nove. Među njima je „Srpski medicinski časopis Lekarske komore“ (SMČLK), koji ovog septembra obeležava svoju petu godišnjicu, što ga čini najnovijim medicinskim časopisom koji izlazi u Srbiji.

O „SRPSKOM MEDICINSKOM ČASOPISU LEKARSKE KOMORE“

Godine 2020, pandemija KOVID-19 oboljenja zaustavila je ceo svet, izazvavši nezapamćenu globalnu zdravstvenu krizu. Osim što je dovela do teških ljudskih gubitaka, paralisala nacionalne privrede i stavila ogroman pritisak na zdravstvene sisteme širom sveta, pandemija je imala i dodatni efekat. Još jednom je podsetila svet na izuzetni značaj kliničke prakse i medicinske nauke. Moglo bi se s pravom reći da je pandemija dokazala da su istinski junaci našeg vremena zdravstveni radnici i medicinski naučnici. Zato je svaki novi časopis koji medicinskim stručnjacima i istraživačima pruža platformu za objavljivanje rezultata naučnog i kliničkog rada od izuzetnog značaja, jer razmena znanja u oblasti medicine pruža dragocene mogućnosti za profesionalni rast i razvoj.

Jedan takav časopis je „Srpski medicinski časopis Lekarske komore“ (SMČLK), čiji je izdavač Lekarska komora Srbije u suizdavaštvu sa Institutom za medicinska istraživanja Univerziteta u Beogradu. Od svog prvog broja, objavljenog pre pet godina usred pandemije KOVID-19 oboljenja, Časopis se razvijao, prevazilazeći brojne izazove [43].

INTRODUCTION

The 2024 list of categorized Serbian scientific journals issued by the Ministry of Science, Technological Development, and Innovation of the Republic of Serbia shows a total of 44 journals issued by domestic publishers that fall under the *medical sciences* category. Of these, four journals – *Acta Veterinaria*, the *Journal of Medical Biochemistry*, the *Serbian Archives of Medicine*, and the *Military Medical and Pharmaceutical Journal of Serbia* – are indexed in the *Web of Science* (SCI-E, SSCI, AHCI) and the *Journal Citation Reports* (JCR) [1]. The remaining 40 are listed as domestic journals [1]. Most of the said journals publish articles in either English or Serbian (with titles and abstracts in both languages); some are published exclusively in the English language or exclusively in the Serbian language, while nine journals publish articles in both languages [1–45]. The oldest medical journal in Serbia is the *Serbian Archives of Medicine*, first published in 1872 [4].

While many domestic medical publications (e.g., the *Serbian Journal of Public Health*, published by the Institute of Public Health of Serbia *Dr Milan Jovanović Batut*) have an established tradition, having been in circulation for a number of decades, some are relatively new. Among them is the *Serbian Journal of the Medical Chamber* (SJMC), which celebrates its fifth anniversary this September, making it the newest medical journal published in Serbia.

ABOUT THE SERBIAN JOURNAL OF THE MEDICAL CHAMBER

In 2020, the COVID-19 pandemic brought the entire world to a halt, causing an unprecedented global health crisis. In addition to resulting in grave casualties, paralyzing economies, and putting tremendous pressure on healthcare systems worldwide, the pandemic had an additional effect. Yet again, it reminded the world of the supreme importance of clinical practice and medical science. One could safely say that the pandemic has proven that the true superheroes of our time are healthcare workers and medical scientists. This is why each new journal offering medical professionals and researchers a platform to present the findings of their scientific and clinical work is of exceptional importance, as shared knowledge in the medical field provides valuable opportunities for professional growth and improvement.

One such journal is the *Serbian Journal of the Medical Chamber* (SJMC), published by the Medical Chamber of Serbia, with the University of Belgrade Institute for Medical Research as co-publisher. Since its first issue, published five years ago, amidst the COVID-19

Časopis je dostupan u štampanom i elektronskom obliku. Godišnje objavljuje najmanje četrdeset neobjavljenih originalnih naučnih istraživačkih radova, preglednih članaka, stručnih radova, kratkih saopštenja, uvodnika, meta-analiza, prikaza slučajeva i drugih vrsta članaka. Ovo je dvojezična publikacija – svaki rad se objavljuje i na srpskom i na engleskom jeziku [43].

Časopis pokriva sve oblasti medicine, farmacije i stomatologije. Uredništvo pažljivo bira rukopise kako bi obezbedilo da se u svakom broju objave kvalitetni članci koji pokrivaju najširi spektar relevantnih tema. Časopis izlazi četiri puta godišnje [43].

„Srpski medicinski časopis Lekarske komore“ objavljuje se u režimu otvorenog pristupa, primenjujući postupak dvostruko slepe recenzije. Čitaoci imaju slobodan, besplatan i neograničen pristup svim radovima odmah po njihovom onlajn objavljivanju. Takođe, ne postoji naknada za podnošenje ili obradu članaka [43]. Ovo je izuzetno značajno za mlade istraživače, jer Časopis pruža potpunu podršku tokom celog procesa, potpuno besplatno – počev od detaljnog procesa recenzije, koji autorima pruža dragocene povratne informacije; preko potpunog i detaljnog uređivanja, lekture i prevodilačkih usluga, koje uključuju konsultacije sa autorima tokom celog procesa radi obezbeđivanja apsolutne preciznosti i visokog kvaliteta teksta; pa sve do visoko kvalitetnog tehničkog uređivanja. Kao rezultat svega ovoga, svaka tri meseca čitaocima se predstavlja izbor kvalitetnih i relevantnih radova koji pokrivaju širok spektar aktuelnih tema.

Ugledni domaći i međunarodni akademici, profesori i stručnjaci čine Uređivački odbor, Izdavački savet i Uredništvo Časopisa [43]. Iskusni i dokazani stručnjaci iz pojedinih medicinskih oblasti biraju se za recenzente. Udružena stručnost, iskustvo i posvećenost svih ovih profesionalaca predstavljaju temelj na kojem je Časopis izgrađen, dok je inovativan i posvećen rad autora, koji svoje članke poveravaju Časopisu, učinio da on postane ono što je danas.

„Srpski medicinski časopis Lekarske komore“ dobio je kategoriju M54 od Ministarstva nauke, tehnološkog razvoja i inovacija Republike Srbije. Indeksiran je u Srpskom citatnom indeksu, a podaci o Časopisu mogu se pronaći na KoBSON-u [43].

Iako se nastoji da većina brojeva obezbedi raznovrsnost, pojedini brojevi Časopisa posvećeni su određenim temama i oblastima, čime se odgovara na aktuelne trendove, okolnosti i događaje.

U skladu s tim, kao odgovor na jedan od najvećih globalnih izazova javnog zdravlja u savremenoj istoriji, Časopis je posvetio ceo broj (Vol. 2, Br. 3, septembar 2021) pandemiji KOVID-19 oboljenja, prikazujući relevantna klinička iskustva i medicinska istraživanja u

pandemic, the Journal has grown, overcoming numerous challenges [43].

The Journal is available in print and electronic format. It annually publishes no less than forty unpublished, original scientific research articles, review articles, professional papers, short communications, editorials, meta-analyses, case reports, and other types of articles. This is a bilingual publication – each article is published in both Serbian and English [43].

The Journal covers all areas of medicine, pharmacy, and dental medicine. The Editorial Board carefully selects manuscripts to ensure that high-quality articles covering the widest range of relevant topics are published in each issue. The Journal releases four issues annually [43].

The *Serbian Journal of the Medical Chamber* is published under an open-access policy using a double-blind peer-review process. Readers have open, free-of-charge, and unlimited access to all articles immediately upon online publication. There are also no fees for article submission or processing [43]. This is exceptionally valuable to young researchers, as the Journal provides full support throughout the entire process, completely free of charge – beginning with a detailed peer review process, which provides authors with valuable feedback; continuing with complete and detailed editing, proofreading, and translation services, which include consultations with the authors during the process to ensure absolute precision and high quality of the text; and concluding with high-level technical editing. As a result, each quarter, the readers are presented with a selection of high-quality, relevant articles covering a wide range of current topics.

Eminent national and international academicians, professors, and experts constitute the Editorial Board, Advisory Board, and Editorial Office [43]. Experienced and proven experts in specific medical fields are selected as reviewers. The joint expertise, experience, and dedication of all these professionals constitute the foundation upon which the Journal is built, while the innovative and dedicated work of the authors who entrust their articles to the Journal has made it what it is today.

The *Serbian Journal of the Medical Chamber* has received the M54 categorization from the Ministry of Science, Technological Development, and Innovation of the Republic of Serbia. It is indexed by the Serbian Citation Index, and data on the Journal can be found on KoBSON [43].

While most of its issues strive to provide variety, certain issues of the Journal have been dedicated to particular topics and areas, thus responding to current trends, circumstances, and events.

Accordingly, responding to one of the greatest global public health challenges in modern history,

ovoj oblasti. Ovaj broj Časopisa sadrži radove po pozivu koje su napisali ugledni stručnjaci iz različitih medicinskih oblasti, predstavljajući iskustva i znanja koja su ih vodila u kliničkoj praksi tokom pandemije KOVID-19 infekcije [46].

Takođe, tematski broj – *Hematologija* (Vol. 5, Br. 3) u potpunosti je posvećen hemato-onkološkim bolestima i izazovima u njihovom dijagnostikovanju i primeni savremenih terapijskih modaliteta [47].

Pored toga, Časopis je objavio četiri knjige apstrakta sa sledećih kongresa:

- Nacionalni kongres sa međunarodnim učešćem *Infekcije – izazovi u dijagnostici i lečenju*
- Nacionalni kongres sa međunarodnim učešćem *Infekcije kod imunosuprimiranih osoba – problemi prepoznavanja, dijagnostike i lečenja*
- Nacionalni simpozijum sa međunarodnim učešćem *Infarkti u kliničkoj praksi*
- Nacionalni kongres *6. kongres hematologa Srbije*
- Nacionalni kongres sa međunarodnim učešćem *Kliničke manifestacije autoimunih bolesti* [48–52].

Časopis, međutim, pre svega obezbeđuje platformu za širok spektar nacionalno, regionalno i međunarodno relevantnih medicinskih tema i pitanja javnog zdravlja.

Dosadašnji radovi objavljeni u „Srpskom medicinskom časopisu Lekarske komore“ – pregled i sažeta analiza

Pregledni metod

Pregled do sada objavljenih brojeva „Srpskog medicinskog časopisa Lekarske komore“ (ne računajući gore navedene knjige apstrakta) pruža uvid u ukupan broj objavljenih radova, vrste članaka, oblasti medicine na koje se objavljeni radovi odnose, kao i afilijacije autora.

Pregled je sproveden putem pažljive i detaljne analize sadržaja svakog dosadašnjeg broja Časopisa, pri čemu je posebna pažnja usmerena na beleženje četiri kategorije podataka:

- ukupan broj članaka po broju;
- afilijacija autora, odnosno, da li je članak napisao domaći autor (autori sa institucija u Srbiji), međunarodni (strani) autor (autori sa institucija van Srbije), ili je članak nastao kao rezultat saradnje domaćih i međunarodnih autora (i institucija);
- broj različitih tipova članaka (onako kako su kategorizovani u Sadržaju svakog broja);
- oblast medicine i/ili tema obrađena u članku.

Autori su klasifikovani kao domaći ili međunarodni na osnovu institucije u kojoj su zaposleni (afilijacije), a ne na osnovu nacionalnosti.

the Journal dedicated an entire issue (Volume 2, No. 3, September 2021) to the COVID-19 pandemic, showcasing relevant clinical experiences and medical research in this particular field. This issue of the Journal contains invited papers written by eminent experts from different medical fields presenting the experience and knowledge that guided them in their clinical practice during the COVID-19 pandemic [46].

Additionally, the thematic issue – *Hematology* (Volume 5, No. 3) is fully dedicated to hemato-oncological diseases and the challenges in establishing their diagnosis and modern therapeutic modalities [47].

Furthermore, the Journal has issued five books of abstracts for the following congresses (symposiums):

- National congress with international participation *Infections – Challenges in Diagnosis and Management*
- National congress with international participation *Infections in Immunocompromised – Problems of Recognition, Diagnosis, and Therapy*
- National symposium with international participation *Infarctions in Clinical Practice*
- National congress *6th Congress of Hematologists of Serbia*
- National congress with international participation *Clinical Manifestations of Autoimmune Diseases* [48–52].

The Journal, however, primarily provides a platform for a wide range of nationally, regionally, and internationally relevant medical issues and public health concerns.

Articles published in the Serbian Journal of the Medical Chamber to date – breakdown and concise analysis

Review method

A review of the issues of the *Serbian Journal of the Medical Chamber* published to date (excluding the books of abstracts listed above) provides insight into the overall number of papers published, the types of articles, the areas of medicine that the published articles pertain to, as well as the affiliations of the authors.

The review was performed by careful and detailed analysis of the contents of each issue to date, with attention to recording four categories of data:

- total number of articles per issue;
- author affiliation, i.e., whether the article was written by domestic authors (authors affiliated to Serbian institutions), international (foreign) authors (authors affiliated to institutions outside Serbia), or whether the article was written as a collaboration between domestic and international authors (and institutions);

Kako bi ovaj pregled na najbolji način odražavao ukupni sadržaj dvadeset brojeva Časopisa, kategorije koje se odnose na oblast medicine, tj. medicinska pitanja obrađena u člancima, nisu bile unapred definisane. Naime, one su formulisane tokom pregleda na osnovu samog sadržaja rada, što je utvrđeno pažljivim razmatranjem svakog objavljenog članka. Uočeno je da određeni broj članaka obuhvata više tema/oblasti, odnosno kategorija, što je takođe zabeleženo i uneto u analizu, pri čemu je svaki takav članak analiziran i uzet u obzir u svakoj od datih kategorija.

Knjige apstrakata su izuzete iz pregleda, a u analizu su uključeni samo redovni tromesečni brojevi.

Izvršena je agregacija svih podataka dobijenih analizom i oni su predstavljeni u narednom poglavlju rada.

REZULTATI

Ukupno je objavljeno 216 članaka u prvih dvadeset brojeva Časopisa. **Tabela 1** prikazuje broj članaka objavljenih po broju i ukupno, kao i prosečan broj članaka objavljenih na godišnjem nivou [46,47,53–70].

Analiza afilijacija autora objavljenih članaka pokazuje koliko je, od ukupno 216 radova, napisano od strane istraživača iz Srbije, koliki broj su napisali strani naučnici, kao i koliko je radova napisano u saradnji između srpskih i inostranih autora. Tabela 2 prikazuje afilijacije autora članaka po broju, kao i ukupan broj članaka koje su napisali domaći autori, strani autori, te broj onih radova koji su nastali kao plod saradnje između srpskih i međunarodnih autora, do danas [46,47,53–70].

Kao što se može uočiti iz podataka prikazanih u **Tabeli 2** i **Grafikonu 1**, većinu (187; 86,6%) članaka napisali su autori iz srpskih institucija, 14 (6,5%) radova su na-

- number of different types of articles published (as categorized in the Contents of each issue);
- field of medicine and/or type of medical issue addressed in the article.

Authors were classified as domestic or international based on their institutional affiliation, rather than their nationality.

So as to tailor the review in such a way as to best reflect the overall content of the twenty issues of the Journal, categories pertaining to the field of medicine, i.e., medical issues addressed in the articles, were not predefined. Rather, they were formulated during the review based on the content of the articles themselves, which was determined through careful deliberation of each article. A number of articles were recognized to span over more than one area/category, which was also noted and entered into the analysis, wherein each such article was analyzed and taken into account in each of these categories.

The books of abstracts were excluded from the review, and only the regular quarterly issues were included in the analysis.

All the data obtained from the analysis have been aggregated and are presented in the next section.

REVIEW RESULTS

A total of 216 articles were published in the first twenty issues of the Journal. **Table 1** presents the number of articles published per issue and in total, as well as the average number of articles per year [46,47,53–70].

Analysis of the affiliations of the authors of the published articles shows how many of the 216 papers were written by researchers from Serbia, how many were authored by international scientists, as well as how many papers were written in collaboration between Serbian

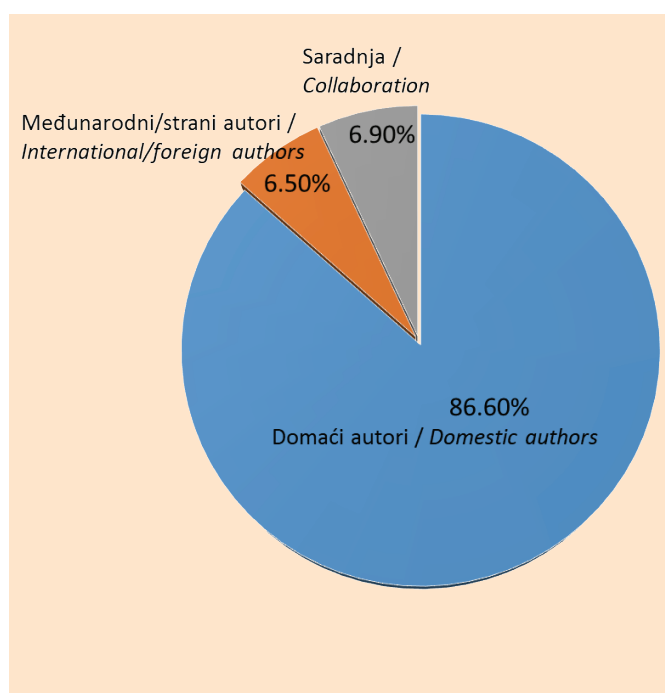
Tabela 1. Broj članaka do sada objavljenih u „Srpskom medicinskom časopisu Lekarske komore“ (po brojevima Časopisa, ukupno i godišnji prosek)

	Vol.1 Br.1 / Vol.1 No.1	Vol.1 Br.2 / Vol.1 No.2	Vol.2 Br.1 / Vol.2 No.1	Vol.2 Br.2 / Vol.2 No.2	Vol.2 Br.3 / Vol.2 No.3	Vol.2 Br.4 / Vol.2 No.4	Vol.3 Br.1 / Vol.3 No.1	Vol.3 Br.2 / Vol.3 No.2	Vol.3 Br.3 / Vol.3 No.3	Vol.3 Br.4 / Vol.3 No.4	Vol.4 Br.1 / Vol.4 No.1	Vol.4 Br.2 / Vol.4 No.2	Vol.4 Br.3 / Vol.4 No.3	Vol.4 Br.4 / Vol.4 No.4	Vol.5 Br.1 / Vol.5 No.1	Vol.5 Br.2 / Vol.5 No.2	Vol.5 Br.3 / Vol.5 No.3	Vol.5 Br.4 / Vol.5 No.4	Vol.6 Br.1 / Vol.6 No.1	Vol.6 Br.2 / Vol.6 No.2	Ukupan broj do sada objavljenih članaka / Total number of articles published to date	Prosečan broj godišnje objavljenih članaka / Mean number of articles per year
Broj članaka objavljenih u svakom broju Časopisa / Number of articles in each issue	8	10	7	12	11	12	12	13	11	11	8	8	10	14	11	12	17	9	10	10	216	43.2

Table 1. Number of articles published in the *Serbian Journal of the Medical Chamber* to date (per issue, in total, and on average per year)

Tabela 2. Broj članaka koje su napisali srpski istraživači, inostrani naučnici, i broj radova nastalih kroz saradnju domaćih i stranih autora, objavljenih u „Srpskom medicinskom časopisu Lekarske komore“, do danas (ukupno i u svakom broju časopisa)

Autori / Authors	Vol.1 Br.1 / Vol.1 No.1	Vol.1 Br.2 / Vol.1 No.2	Vol.2 Br.1 / Vol.2 No.1	Vol.2 Br.2 / Vol.2 No.2	Vol.2 Br.3 / Vol.2 No.3	Vol.2 Br.4 / Vol.2 No.4	Vol.3 Br.1 / Vol.3 No.1	Vol.3 Br.2 / Vol.3 No.2	Vol.3 Br.3 / Vol.3 No.3	Vol.3 Br.4 / Vol.3 No.4	Vol.4 Br.1 / Vol.4 No.1	Vol.4 Br.2 / Vol.4 No.2	Vol.4 Br.3 / Vol.4 No.3	Vol.4 Br.4 / Vol.4 No.4	Vol.5 Br.1 / Vol.5 No.1	Vol.5 Br.2 / Vol.5 No.2	Vol.5 Br.3 / Vol.5 No.3	Vol.5 Br.4 / Vol.5 No.4	Vol.6 Br.1 / Vol.6 No.1	Vol.6 Br.2 / Vol.6 No.2	Ukupno / Total
Domaći / Domestic	8	10	7	11	10	12	12	11	9	11	5	8	6	9	10	10	17	5	8	8	187
Strani / International				1	1			1	2		1			2	1	1		3	1		14
Saradnja / Collaboration								1			2		4	3		1		1	1	2	15

**Grafikon 1.** Članci objavljeni u "Srpskom medicinskom časopisu Lekarske komore", do danas, prikazani u odnosu na afilijaciju autora (%)**Graph 1.** Articles published in the *Serbian Journal of the Medical Chamber* to date, by author affiliation (%)

pisali strani istraživači, dok je 15 (6,9%) članaka nastalo kao rezultat saradnje naučnika iz srpskih i stranih, odnosno međunarodnih institucija.

Analiza tipova članaka objavljenih u „Srpskom medicinskom časopisu Lekarske komore“ u proteklih pet godina otkrila je vrste radova objavljenih u prvih dvadeset brojeva.

Kao što je prikazano u Tabeli 3 i Grafikonu 2, većina objavljenih radova bili su originalni članci (82; 38%), pregledni članci (62; 28,5%) i studije slučajeva/prikazi slučajeva/serije slučajeva (48; 22,2%), slede prikazi

Table 2. Number of articles written by Serbian authors, international authors, and through collaboration between Serbian and international authors, published in the *Serbian Journal of the Medical Chamber* to date (per issue and in total)

and international authors. Table 2 provides insight into the affiliation of the authors of the articles per issue, as well as the overall number of articles written by domestic authors, international authors, and those written in collaboration between Serbian and international authors, to date [46,47,53–70].

As is apparent from the data presented in Table 2 and Graph 1, the majority (187; 86.6%) of the articles were written by authors affiliated with Serbian institutions, 14 (6.5%) were written by international researchers, while 15 (6.9%) articles were the result of a collaborative effort.

Analysis of the categories of articles published in the past five years in the *Serbian Journal of the Medical Chamber* has revealed the types of papers published in the first twenty issues.

As presented in Table 3 and Graph 2, the majority of the articles published were original articles (82; 38%), review articles (62; 28.5%), and case studies/reports/case series (48; 22.2%), followed by book reviews (7; 3.2%), current topic/in focus articles (5; 2.3%), history of medicine articles (4; 1.9%), letters to the editor (3; 1.4%), and professional articles (2; 0.9%). The remaining articles (1.6%) were: one report, two invited papers, of which one was a review article, as well as one editorial.

Finally, over the past five years, the *Serbian Journal of the Medical Chamber* has covered a wide array of topics. Table 4 presents the articles covering different topics/fields of medicine/medical issues. The data are presented by issue and in total.

Additionally, throughout all the issues to date, several articles have been identified to cover at least two medical fields, i.e., issues simultaneously. This has also been documented and marked accordingly in Table 4.

As presented in Table 4 and Graph 3, the topics/areas generating the highest interest among researchers

Tabela 3. Tipovi članaka objavljenih do sada u „Srpskom medicinskom časopisu Lekarske komore“ (u svakom broju Časopisa i ukupno)

Tip članka / Type of article	Vol.1 Br.1 / Vol.1 No.1	Vol.1 Br.2 / Vol.1 No.2	Vol.2 Br.1 / Vol.2 No.1	Vol.2 Br.2 / Vol.2 No.2	Vol.2 Br.3 / Vol.2 No.3	Vol.2 Br.4 / Vol.2 No.4	Vol.3 Br.1 / Vol.3 No.1	Vol.3 Br.2 / Vol.3 No.2	Vol.3 Br.3 / Vol.3 No.3	Vol.3 Br.4 / Vol.3 No.4	Vol.4 Br.1 / Vol.4 No.1	Vol.4 Br.2 / Vol.4 No.2	Vol.4 Br.3 / Vol.4 No.3	Vol.4 Br.4 / Vol.4 No.4	Vol.5 Br.1 / Vol.5 No.1	Vol.5 Br.2 / Vol.5 No.2	Vol.5 Br.3 / Vol.5 No.3	Vol.5 Br.4 / Vol.5 No.4	Vol.6 Br.1 / Vol.6 No.1	Vol.6 Br.2 / Vol.6 No.2	Ukupno / Total
Originalni članci / Original articles	3	2		8	4	3	4	4	6	3	3	1	4	7	6	4	7	6	4	3	82
Pregledni članci / Review articles	3		3	1	3	5	5	3	3	5	3	6	6	1*	1	3	7		1	3	62
Studije slučajeva/Prikazi slučajeva/Serije slučajeva / Case studies/Case reports/Case series	1	2	2		3	3	2	5		3	2	1		6	2	4	3	3	3	3	48
Stručni članci / Professional articles								1								1					2
Aktuelne teme (u fokusu) / Current topic/In focus articles	1			1	1		1												1		5
Članci iz istorije medicine / History of medicine articles		3																		1	4
Prikazi knjiga / Book reviews		2	2	1					1						1						7
Pisma uredniku / Letters to the editor				1		1													1		3
Izveštaji / Reports									1												1
Radovi po pozivu / Invited papers														1*	1						2
Uvodnik / Editorial		1																			1

*Članak koji spada u dve različite kategorije i koji je ujedno predstavljen u obe kategorije

*An article falling under two different categories and presented in both categories

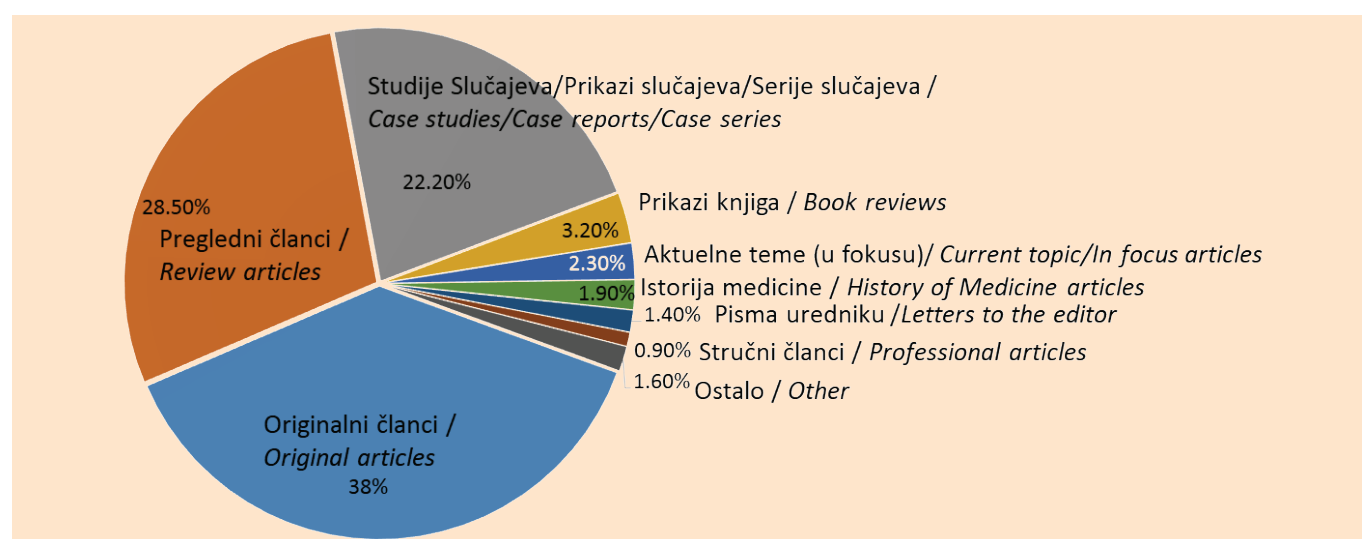
**Grafikon 2.** Tipovi članaka do sada objavljenih u "Srpskom medicinskom časopisu Lekarske komore" (%)**Graph 2.** Articles published in the Serbian Journal of the Medical Chamber to date, by type (%)

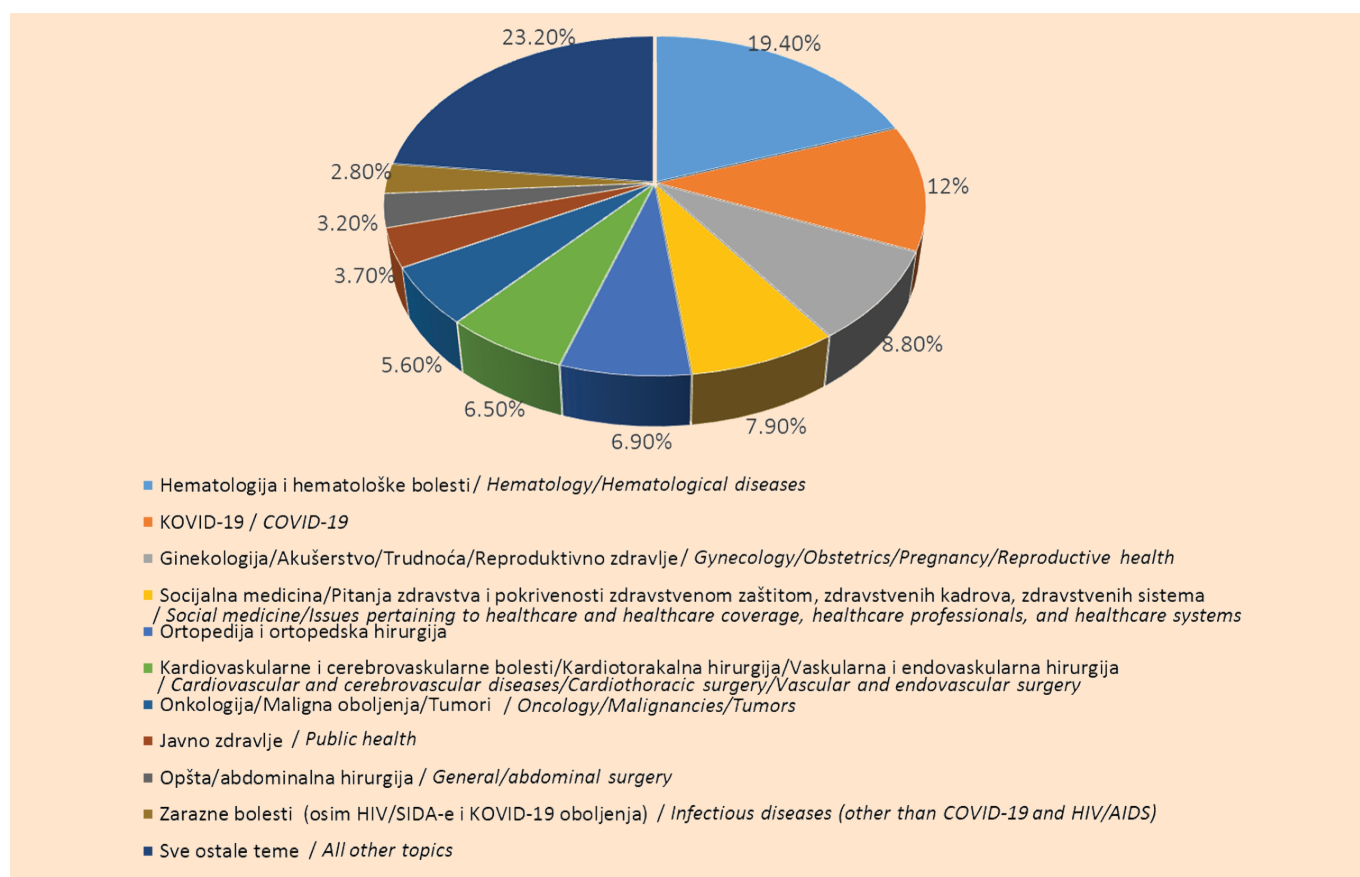
Tabela 4. Teme/oblasti medicine obrađene u člancima do sada objavljenim u „Srpskom medicinskom časopisu Lekarske komore“ (u svakom broju Časopisa i ukupno)**Table 4.** Topics/medical fields/medical issues covered by the articles published to date in the *Serbian Journal of the Medical Chamber* (per issue and in total)

Tema/oblast medic / Medical field/topic/issue	Vol. 1 Br. 1 / Vol. 1 No. 1	Vol. 1 Br. 2 / Vol. 1 No. 2	Vol. 2 Br. 1 / Vol. 2 No. 1	Vol. 2 Br. 2 / Vol. 2 No. 2	Vol. 2 Br. 3 / Vol. 2 No. 3	Vol. 2 Br. 4 / Vol. 2 No. 4	Vol. 3 Br. 1 / Vol. 3 No. 1	Vol. 3 Br. 2 / Vol. 3 No. 2	Vol. 3 Br. 3 / Vol. 3 No. 3	Vol. 3 Br. 4 / Vol. 3 No. 4	Vol. 4 Br. 1 / Vol. 4 No. 1	Vol. 4 Br. 2 / Vol. 4 No. 2	Vol. 4 Br. 3 / Vol. 4 No. 3	Vol. 4 Br. 4 / Vol. 4 No. 4	Vol. 5 Br. 1 / Vol. 5 No. 1	Vol. 5 Br. 2 / Vol. 5 No. 2	Vol. 5 Br. 3 / Vol. 5 No. 3	Vol. 5 Br. 4 / Vol. 5 No. 4	Vol. 6 Br. 1 / Vol. 6 No. 1	Vol. 6 Br. 2 / Vol. 6 No. 2	Ukupno / Total
Akademsko pisanje/pisanje naučnih publikacija <i>Academic writing/Scientific writing</i>			1																		1
Bolesti zavisnosti <i>Addictions</i>													1								1
Alergologija <i>Allergology</i>															1						1
Audiologija <i>Audiology</i>	1																				1
Anatomija – varijacije/anomalije i njihovo lečenje <i>Anatomy – variations/anomalies and their treatment</i>										1				1		1					3
Anesteziologija <i>Anesthesiology</i>										1											1
KOVID-19 i medicinska stanja i komplikacije uzrokovane KOVID-19 oboljenjem <i>COVID-19 and COVID-19-related issues and complications</i>				1	11	6	5	1*		1									1**		26
Kardiovaskularne i cerebrovaskularne bolesti/Kardior- akalna hirurgija/Vaskularna i endovaskularna hirurgija <i>Cardiovascular and cerebrovascular diseases/Cardiothoracic surgery/Vascular and endovascular surgery</i>			1					2		1, 1*		1	1, 1**	1, 1***		1		1	1	1	14
Celularna i molekularna medicina <i>Cellular and molecular medicine</i>																				1	1
Stomatologija <i>Dental medicine</i>				1*														1*			2
Dijagnostika <i>Diagnostics</i>							1**														1
Ishrana <i>Dietary issues and considerations</i>															1						1
Dijabetes i ostala metabolička oboljenja <i>Diabetes and other metabolic diseases</i>																1					1
Urgentna medicina <i>Emergency medicine</i>													1***								1
Opšta/abdominalna hirurgija <i>General/abdominal surgery</i>	1	2						1					1		2						7
Ginekologija/Akušerstvo/Trudnoća/Reproduktivno zdravlje <i>Gynecology/Obstetrics/Pregnancy/Reproductive health</i>		1	1	1		1		1	1	1	1	1, 1*	1*, 1		2	1*, 1**		1	1	1	19
Gerijatrija <i>Geriatric medicine</i>							1		1, 1*												3
Opšte medicinske teme/Drugo <i>General/Other</i>				1			1**											1**			3
Hematologija/Hematološke bolesti <i>Hematology</i>				5		3	3	3	3					2		1*, 3	17		2		42
HIV/SIDA <i>HIV/AIDS</i>	1											1*									2
Istorija medicine <i>History of medicine</i>		3																		1*	4
Hiperbarična medicina <i>Hyperbaric medicine</i>										1											1
Zarazne bolesti (osim HIV/SIDA-e i KOVID-19 oboljenja) <i>Infectious diseases (other than COVID-19 and HIV/AIDS)</i>		1		1			1		1*, 1											1	6

Tema/oblast medicini / Medical field/topic/issue	Vol.1 Br.1 / Vol.1 No.1	Vol.1 Br.2 / Vol.1 No.2	Vol.2 Br.1 / Vol.2 No.1	Vol.2 Br.2 / Vol.2 No.2	Vol.2 Br.3 / Vol.2 No.3	Vol.2 Br.4 / Vol.2 No.4	Vol.3 Br.1 / Vol.3 No.1	Vol.3 Br.2 / Vol.3 No.2	Vol.3 Br.3 / Vol.3 No.3	Vol.3 Br.4 / Vol.3 No.4	Vol.4 Br.1 / Vol.4 No.1	Vol.4 Br.2 / Vol.4 No.2	Vol.4 Br.3 / Vol.4 No.3	Vol.4 Br.4 / Vol.4 No.4	Vol.5 Br.1 / Vol.5 No.1	Vol.5 Br.2 / Vol.5 No.2	Vol.5 Br.3 / Vol.5 No.3	Vol.5 Br.4 / Vol.5 No.4	Vol.6 Br.1 / Vol.6 No.1	Vol.6 Br.2 / Vol.6 No.2	Ukupno / Total
Imunologija/Autoimune bolesti Immunology/Autoimmune diseases											1		1								2
Medicinska statistika Medical statistics				1														1**			2
Menadžment u medicini Management in medicine										1								1			2
Neurohirurgija Neurosurgery	1		1																		2
Neurologija Neurology										1	1	1									3
Onkologija/Maligna oboljenja/Tumori Oncology/Malignancies/Tumors				1						1			1, 1*, 1**	1*, 1		1**		1***, 1	1*, 1		12
Oftalmologija Ophthalmology																		1***	1	1	3
Ortopedija/Ortopedska hirurgija Orthopedic surgery/Orthopedics		1	2				2	1	1		1	1		2					1**	2, 1*	15
Medicina bola Pain medicine/Pain management			1						1												2
Patologija/Histopatologija Pathology/Histopathology														1, 1*							2
Pedijatrija/dečija hirurgija Pediatrics/Pediatric surgery																1					1
Farmakologija Pharmacology	2	1*																			3
Fizikalna terapija Physical therapy	1																				1
Psihijatrija/Mentalno zdravlje Psychiatry/Mental health		1*				1										1		1			4
Javno zdravlje Public health		1**		1*				1*	1*, 2					1**					1*		8
Pulmologija Pulmonology											1	1	1		1						4
Radiologija Radiology/Imaging							1	1				1		1							4
Sportska medicina Sports medicine								1													1
Socijalna medicina/Pitanja zdravstva i pokrivenosti zdravstvenom zaštitom, zdravstvenih kadrova, zdravstvenih sistema Social medicine/Issues pertaining to healthcare and healthcare coverage, healthcare professionals and healthcare systems									1		3		2	1	2	2		1, 1*	2	2	17
Sistemske bolesti i stanja Systemic diseases and conditions											1				1						2
Transfuzijska medicina Transfusion medicine	1																				1
Traumatologija Traumatology						1															1
Vakcinacija Vaccination		1**												1**	1						3

* , ** , *** Članak koji pokriva različite kategorije i koji je ujedno predstavljen u svakoj od kategorija

* , ** , *** An article falling under different categories and presented in each of the categories



Grafikon 3. Teme/oblasti medicine obrađene u člancima do sada objavljenim u "Srpskom medicinskom časopisu Lekarske komore" (%)

Graph 3. Topics/medical fields/medical issues covered by the articles published to date in the *Serbian Journal of the Medical Chamber* (%)

knjiga (7; 3,2%), članci koji obrađuju aktuelne teme (u fokusu), (5; 2,3%), članci iz istorije medicine (4; 1,9%), pisma uredniku (3; 1,4%) i stručni članci (2; 0,9%). Preostali članci (1,6%) bili su: jedan izveštaj, dva rada po pozivu, od kojih je jedan bio pregledni članak, kao i jedan uvodnik.

Najzad, valja reći da je „Srpski medicinski časopis Lekarske komore“, tokom proteklih pet godina, obrađivao širok spektar tema. U **Tabeli 4** objavljeni članci su prikazani u odnosu na različite teme/oblasti medicine/medicinska pitanja koje pokrivaju. Podaci su prikazani po brojevima Časopisa i ukupno.

Ujedno je, u dosadašnjim brojevima Časopisa, identifikovano je nekoliko članaka koji pokrivaju najmanje dve medicinske oblasti, odnosno teme, istovremeno. Ovo je takođe dokumentovano i shodno tome označeno u **Tabeli 4**.

Kao što je prikazano u **Tabeli 4** i **Grafikonu 3**, teme/oblasti koje su izazvale najveće interesovanje među istraživačima koji su objavili svoje radove u „Srpskom medicinskom časopisu Lekarske komore“ u proteklih pet godina su bile sledeće: hematologija i hematološke bolesti (42; 19,4%), KOVID-19 (26; 12%), ginekologija/akušerstvo/trudnoća/reproduktivno zdravlje (19; 8,8%), socijalna medicina/pitanja zdravstva i pokrivenosti zdravstvenom zaštitom, zdravstvenih kadrova, zdravstvenih sistema (17; 7,9%), ortopedija i ortopedijska hirurgija (15; 6,9%), kardiovaskularne i cerebrovaskularne bolesti/kardiorakalna hirurgija/vaskularna i endovaskularna hirurgija (14; 6,5%), onkologija/maligna oboljenja/tumori (12; 5,6%), javno zdravlje (8; 3,7%), opšta/abdominalna hirurgija (7; 3,2%), i zarazne bolesti (osim HIV/SIDA-e i COVID-19 oboljenja) (6; 2,8%).

publishing in the *Serbian Journal of the Medical Chamber* in the past five years have been the following: hematology and hematological diseases (42; 19.4%), COVID-19 (26; 12%), gynecology/obstetrics/pregnancy/reproductive health (19; 8.8%), social medicine/issues pertaining to healthcare and healthcare coverage/healthcare professionals/healthcare systems (17; 7.9%), orthopedics and orthopedic surgery (15; 6.9%), cardiovascular and cerebrovascular diseases/cardiothoracic surgery/vascular and endovascular surgery (14; 6.5%), oncology/malignancies/tumors (12; 5.6%), public health (8; 3.7%), general/abdominal surgery (7; 3.2%), and infectious diseases (other than COVID-19 and HIV/AIDS) (6; 2.8%). These are followed by other topics, including psychiatry and mental illnesses, pulmonology, radiology/imaging, and numerous other medical fields, issues, and topics [46,47,53–70].

BRIEF ANALYSIS AND CONCLUSION

As can be seen from **Table 1**, the average number of articles published in the *Serbian Journal of the Medical Chamber* annually, thus far, is 43,2, which exceeds the minimum of 40 articles per annum. Bearing in mind the numerous challenges that have been put before the entire medical community during the COVID-19

nosti zdravstvenom zaštito, zdravstvenih kadrova, zdravstvenih sistema (17; 7,9%), ortopedija i ortoped-ska hirurgija (15; 6,9%), kardiovaskularne i cerebrova-skularne bolesti/kardiorakalna hirurgija/vaskularna i endovaskularna hirurgija (14; 6,5%), onkologija/ma-ligna oboljenja/tumori (12; 5,6%), javno zdravlje (8; 3,7%), opšta/abdominalna hirurgija (7; 3,2%) i zarazne bolesti (osim KOVID-19 i HIV/SIDA-a) (6; 2,8%). Slede druge teme, uključujući psihijatriju i mentalne bole-sti, pulmologiju, radiologiju i brojne druge medicinske oblasti, pitanja i teme [46,47,53–70].

KRATKA ANALIZA SA ZAKLJUČKOM

Kao što se može videti u **Tabeli 1**, prosečan broj članaka objavljenih u „Srpskom medicinskom časopisu Lekarske komore“ na godišnjem nivou, do sada, iznosi 43,2, što premašuje definisani minimum od 40 članaka go-dišnje. Imajući u vidu brojne izazove sa kojima se su-očila čitava medicinska zajednica tokom pandemije KOVID-19 oboljenja i njenih posledica, a koja se desila upravo u vreme osnivanja Časopisa, može se reći da je održavanje ovakvog nivoa posvećenosti samo po sebi uspeh.

Kao novi medicinski časopis, upravo u vreme nave-dene vanredne situacije na globalnom nivou, Časopis je takođe uspeo da pobudi i održi interesovanje među-narodnih autora, kao i da podstakne saradnju između srpskih i stranih istraživača i institucija.

Predominacija originalnih članaka objavljenih u Časopisu, kao i značajan broj prikaza slučajeva i studija slučaja iz svih oblasti medicine, svedoče o očiglednoj motivaciji istraživača da predstave svoja nova saznanja i da rezultate svog rada povere „Srpskom medicinskom časopisu Lekarske komore“. Raznovrsnost tipova člana-ka dokaz je da Časopis može da zadovolji i prilagodi se potrebama istraživača u različitim formatima, istovre-meno pružajući čitaocima širok dijapazon podataka.

Najzad, širok raspon medicinskih specijalnosti, od-nosno različitih medicinskih tema i pitanja predstavlje-nih u člancima Časopisa, kao i činjenica da mnogi od objavljenih radova obuhvataju više od jedne oblasti, predstavlja još jedan jasan pokazatelj uspeha Časopisa u održavanju interesovanja i motivacije istraživača da objavljuju svoje radove u „Srpskom medicinskom časopisu Lekarske komore“.

Obeležavajući petu godišnjicu od izlaska prvog broja „Srpski medicinski glasnik Lekarske komore“ na-stoji da bude komplementaran sa delatnošću drugih domaćih medicinskih časopisa sa dužom tradicijom, ali i da utre svoj put i uspostavi sopstvenu tradiciju i vrednost. Prvi ključni koraci već su učinjeni – Časopis se od 2023. godine nalazi na Listi kategorisanih naučnih časopisa domaćih izdavača (za 2024. godinu) Ministar-

pandemic and its aftermath, which was the time of the inception of the Journal, one might say that maintain-ing this level of commitment has been a success in it-self.

As a new medical publication, and in the above-men-tioned worldwide state of emergency, the Journal has also succeeded in eliciting and maintaining the interest of international authors as well as promoting collabora-tion between Serbian and international researchers and institutions.

The predominance of original articles published by the Journal, as well as a significant number of case reports and case studies from all fields of medicine speaks to the evident motivation of researchers to present their new findings and to entrust the results of their hard work to the *Serbian Journal of the Medical Chamber*, while the variety of article types is proof that the Journal can cover and accommodate the needs of researchers in different formats, at the same time pro-viding a wide variety of information to the readers.

Finally, the demonstrated wide array of medical specialties, i.e., different medical issues presented by the articles in the Journal, as well as the fact that many of these articles span beyond just one area, represent another definite indicator of the Journal's success in maintaining the interest and motivation of researchers to publish their work in the SJMC.

Celebrating the fifth anniversary of its first issue, the *Serbian Journal of the Medical Chamber* strives to complement the activity of other domestic medical journals with a longer tradition, but also to pave its own path and confirm its own tradition and worth. The first crucial steps have been made – the Journal has been on the list of categorized Serbian scientific journals issued by the Ministry of Science, Technological Development, and Innovation of the Republic of Serbia since 2023, maintaining its volume of published articles and the interest and motivation of authors. At the same time, a team of dedicated and skilled experts continues to tirelessly work on preserving and pro-moting the quality of this publication. All this is both a prerequisite for continued growth and advancement as well as proof that the right steps have been taken to this effect, which is, hopefully, an indicator of a prom-ising future ahead.

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stva nauke, tehnološkog razvoja i inovacija Republike Srbije, održavajući pritom obim objavljenih radova i interesovanje i motivaciju autora. Istovremeno, tim posvećenih i stručnih ljudi neumorno radi na očuvanju i unapređenju kvaliteta ove publikacije. Sve to zajedno predstavlja i preduslov za dalji rast i napredak, ali i dokaz da su učinjeni pravi potezi u tom pravcu, što je, nadamo se, pokazatelj svetle budućnosti.

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LITERATURA / REFERENCES

1. Ministarstvo nauke, tehnološkog razvoja i inovacija Republike Srbije. Lista kategorisanih naučnih časopisa domaćih izdavača za 2024. godinu. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://nitra.gov.rs/images/nauka/Kategorizacija%20naučnih%20časopisa/2025-03-17/List-a-casopisa-2024.pdf>
2. Acta Veterinaria. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.actaveterinaria.rs/>
3. Journal of Medical Biochemistry. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://english.dmbj.org.rs/journal-of-medical-biochemistry/>
4. Srpski arhiv za celokupno lekarstvo. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <http://www.srpskiarhiv.rs/>
5. Vojnosanitetski pregled. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.vsp.mod.gov.rs/cir/1/o-casopisu>
6. Acta Facultatis Medicae Naissensis. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: http://publisher.medfak.ni.ac.rs/AFMN_1/
7. Balkan Journal of Dental Medicine. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://balkandentaljournal.com/>
8. Exercise and Quality of Life. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.eqoljournal.com/>
9. Facta Universitatis. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://casopisi.junis.ni.ac.rs/index.php/FUPhysEdSport>
10. Experimental and Applied Biomedical Research (EABR). [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <http://www.medf.kg.ac.rs/eabr/index.php>
11. Engrami. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.engrami.rs/o-casopisu/>
12. Arhiv veterinarske medicine. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://niv.ns.ac.rs/e-avm/index.php/e-avm>
13. Arhiv za farmaciju. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://sfus.rs/arhiv-za-farmaciju/>
14. Veterinarski glasnik. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.veterinarskiglasnik.rs/index.php/vg/about#Article>
15. Medicinski časopis. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: [https://www.medicinskicasopis.org/2020\(4\).php](https://www.medicinskicasopis.org/2020(4).php)
16. Specijalna edukacija i rehabilitacija. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.casopis.fasper.bg.ac.rs/index.html>
17. Acta Medica Medianae. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: https://publisher.medfak.ni.ac.rs/AMM_1/indexrs.html
18. Archive of Oncology. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <http://www.onk.ns.ac.rs/Archive/Info.htm>
19. Hospital Pharmacology. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.hophonline.org/?lang=en>
20. Pons : medicinski časopis. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://plus.cobiss.net/cobiss/sr/sr/bib/115713804>
21. Sanamed. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://new.sanamed.rs/>
22. Beogradska defektološka škola. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.belgradeschool.com/>
23. Komora zdravstvenih ustanova Srbije. Zdravstvena zaštita. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.komorazus.org.rs/o-casopisu>
24. Medicinski pregled. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://medicinskipregled.rs/>
25. Medicinski podmladak. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: https://med.bg.ac.rs/?page_id=15961&script=lat
26. Opšta medicina. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: http://www.opstamedicina.org/om_ilustracija.asp
27. Stomatološki glasnik Srbije. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <http://www.stomatoloskiglasnik.rs/>
28. Timočki medicinski glasnik. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.tmg.org.rs/pocetak.htm>
29. Acta Stomatologica Naissi. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: http://publisher.medfak.ni.ac.rs/ASN_1/
30. Apollineum medicum et aesculapium. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.sld-leskovac.com/publikacije.html>
31. Facta Universitatis Series: Medicine and Biology. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://casopisi.junis.ni.ac.rs/index.php/FUMedBiol/index>
32. Balneoclimatologia. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://plus.cobiss.net/cobiss/sr/sr/bib/medfbg/5961730>
33. MD – Medical data. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.md-medicaldata.com/>
34. Serbian Journal of Anesthesia and Intensive Therapy. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://sjait.uais.rs/o-casopisu/>
35. ABC – časopis urgentne medicine. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://scindeks.ceon.rs/journalDetails.aspx?issn=1451-1053>

36. Medicinski glasnik Specijalne bolnice za bolesti štitaste žlezde i bolesti metabolizma "Zlatibor". [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://plus.cobiss.net/cobiss/sr/sr/bib/200154380>
37. Medicinska istraživanja. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://medicalresearch.med.bg.ac.rs/>
38. Preventivna pedijatrija. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://prevped.preventivnapedijatrija.rs/index.php/casopis/issue/view/3>
39. Sestrinska reč. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.umsts.org/casopis.html>
40. Srce i krvni sudovi. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.uksrb.rs/casopisi/arhiva>
41. Halo 194. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.halo194.rs/sr/>
42. Medicinska reč. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://medicinskarec.com/>
43. Srpski medicinski časopis lekarske komore. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://smj.rs/sr/>
44. Glasnik javnog zdravlja. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://serbjph.batut.org.rs/index.php?p=120>
45. Akademija strukovnih studija Beograd. Education and Research in Health Sciences. [Internet]. [Pristupljeno: 15. 7. 2025.]. Dostupno: <https://www.vzsbeograd.edu.rs/sr/publikacije/erhs.html>
46. Srpski medicinski časopis lekarske komore. Vol. 2; No. 3. 2021. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2024/09/SMC-LK-SJMC-vol_5-no_3.pdf
47. Srpski medicinski časopis lekarske komore. Vol. 5; No. 3. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2024/09/SMC-LK-SJMC-vol_5-no_3.pdf
48. Serbian Journal of the Medical Chamber. Book of Abstracts. National congress with international participation. Infections – Challenges in Diagnosis and Management. Vol. 4; Suppl. I. 2023. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2023/Volumen%204%20Data%201%20-%20knjiga%20sazetaka.pdf>
49. Serbian Journal of the Medical Chamber. Book of Abstracts. National congress with international participation. Infections in Immunocompromised – Problems of Recognition, Diagnosis, and Therapy. Vol. 5; Suppl. I. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2024/03/Supplement%201%202024%20-%20MART.pdf>
50. Serbian Journal of the Medical Chamber. Book of Abstracts. National symposium with international participation. Infarctions in Clinical Practice. Vol. 5; Suppl. II. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2024/03/Supplement%202%202024%20-%20MART.pdf>
51. Serbian Journal of the Medical Chamber. Book of Abstracts. National congress. 6th Congress of Hematologists of Serbia. Book of Abstracts. Vol. 5; Suppl. III. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2024/09/Supplement_3_2024_-_SEPTEMBAR.pdf
52. Serbian Journal of the Medical Chamber. Book of Abstracts. National congress with international participation. Clinical Manifestations of Autoimmune Diseases. Vol. 6; Suppl. I. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://www.smj.rs/images/2025/06/2025-06_Supplement_1.pdf
53. Serbian Journal of the Medical Chamber. Vol. 1; No. 1. 2020. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/arhiva/SMC-LK-SJMC-09-2020.pdf>
54. Serbian Journal of the Medical Chamber. Vol. 1; No. 2. 2020. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/arhiva/SMC-LK-SJMC-12-2020.pdf>
55. Serbian Journal of the Medical Chamber. Vol. 2; No. 1. 2021. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2021/003/SM-CLK-SJMC-03-2021.pdf>
56. Serbian Journal of the Medical Chamber. Vol. 2; No. 2. 2021. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2021/004/SM-CLK-SJMC-04-2021.pdf>
57. Serbian Journal of the Medical Chamber. Vol. 2; No. 4. 2021. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2021/006/SM-CLK-SJMC-06-2021.pdf>
58. Serbian Journal of the Medical Chamber. Vol. 3; No. 1. 2022. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2022/007/SM-CLK-SJMC-07-2022.pdf>
59. Serbian Journal of the Medical Chamber. Vol. 3; No. 2. 2022. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2022/008/SM-CLK-SJMC-08-2022.pdf>
60. Serbian Journal of the Medical Chamber. Vol. 3; No. 3. 2022. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2022/009/SM-CLK-SJMC-09-2022.pdf>
61. Serbian Journal of the Medical Chamber. Vol. 3; No. 4. 2022. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://smj.rs/images/2022/010/SM-CLK-SJMC-10-2022.pdf>
62. Serbian Journal of the Medical Chamber. Vol. 4; No. 1. 2023. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/vol4/no1/SMCLK-SJMC-vol_4-no_1.pdf
63. Serbian Journal of the Medical Chamber. Vol. 4; No. 2. 2023. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2023/06/SMCLK-SJMC-vol_4-no_2.pdf
64. Serbian Journal of the Medical Chamber. Vol. 4; No. 3. 2023. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2023/09/SMCLK-SJMC-vol_4-no_3.pdf
65. Serbian Journal of the Medical Chamber. Vol. 4; No. 4. 2023. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2023/12/SMCLK-SJMC-vol_4-no_4.pdf
66. Serbian Journal of the Medical Chamber. Vol. 5; No. 1. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2024/03/SMCLK-SJMC-vol_5-no_1.pdf
67. Serbian Journal of the Medical Chamber. Vol. 5; No. 2. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://smj.rs/images/2024/06/SMCLK-SJMC-vol_5-no_2.pdf
68. Serbian Journal of the Medical Chamber. Vol. 5; No. 4. 2024. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://www.smj.rs/images/2024/12/SM-CLK-SJMC-vol_5-no_4.pdf
69. Serbian Journal of the Medical Chamber. Vol. 6; No. 1. 2025. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: https://www.smj.rs/images/2025/03/SM-CLK-SJMC-vol_6-no_1.pdf
70. Serbian Journal of the Medical Chamber. Vol. 6; No. 2. 2025. [Internet]. [Pristupljeno: 16. 7. 2025.]. Dostupno: <https://www.smj.rs/images/2025/06/SM-CLK-SJMC-06-2025.pdf>

DUKTALNI KARCINOM *IN SITU*: AKTUELNI DIJAGNOSTIČKI I TERAPIJSKI PRISTUPI

PREGLEDNI RAD

REVIEW ARTICLE

DUCTAL CARCINOMA *IN SITU*: CURRENT DIAGNOSTIC AND THERAPEUTIC APPROACHES

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SAŽETAK

Razvoj metoda skrininga značajno je povećao učestalost dijagnostikovanja duktalnog karcinoma *in situ* (DCIS). Iako se odlikuje visokom stopom preživljavanja, DCIS predstavlja klinički izazovan entitet zbog svoje biološke heterogenosti i potencijala za progresiju u invazivni duktalni karcinom (IDC). Mamografija i dalje ostaje primarna dijagnostička metoda, pri čemu su mikrokalcifikacije najčešći nalaz. Lečenje je prvenstveno hirurško – lumpektomijom ili mastektomijom, u zavisnosti od proširenosti lezije. U slučajevima poštenih operacija preporučuje se adjuvantna radioterapija radi smanjenja rizika od lokalnog recidiva, dok se hormonska terapija (tamoksifen i inhibitori aromataze) primenjuje kod hormonski pozitivnih tumora. Disekcija aksilarnih limfnih čvorova ne sprovodi se rutinski, ali može biti indikovana u slučaju mikroinvazije. U novije vreme, aktivni nadzor razmatra se kao alternativa kod pacijentkinja niskog rizika, pri čemu su savremena istraživanja fokusirana na razvoj prognostičkih faktora za precizniju stratifikaciju rizika.

Ovaj rad pruža pregled savremenih multidisciplinarnih pristupa dijagnostike i lečenja DCIS-a, zasnovanih na najnovijim saznanjima iz naučne literature.

Ključne reči: duktalni karcinom *in situ*, mamografija, mastektomija, lumpektomija, hormonska terapija

ABSTRACT

Advancements in breast cancer screening have significantly increased the incidence of ductal carcinoma *in situ* (DCIS) diagnoses. Despite its favorable prognosis, DCIS poses a clinical challenge due to its biological heterogeneity and potential progression to invasive ductal carcinoma (IDC). Mammography remains the primary diagnostic modality, with microcalcifications as the most common radiological finding. Management is primarily surgical, involving either breast-conserving surgery (BCS) or mastectomy, depending on the extent of the lesion. In patients undergoing BCS, adjuvant radiotherapy is recommended to reduce the risk of local recurrence, while hormonal therapy (tamoxifen or aromatase inhibitors) is indicated for hormone receptor-positive tumors. Axillary lymph node dissection is not routinely performed but may be considered in cases with suspected microinvasion. Recently, active surveillance has emerged as a potential alternative for selected low-risk patients. Ongoing research is focused on the identification of prognostic factors to enable more precise risk stratification.

This review provides an overview of current multidisciplinary approaches to the diagnosis and treatment of DCIS, based on the latest scientific evidence.

Keywords: ductal carcinoma *in situ*, mammography, mastectomy, lumpectomy, hormonal therapy

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UVOD

Duktalni karcinom in situ (engl. *ductal carcinoma in situ* – DCIS) predstavlja neinvazivni oblik karcinoma dojke koji se karakteriše proliferacijom malignih epitelnih ćelija unutar duktalnog sistema, bez probijanja bazalne membrane i infiltracije okolnog tkiva [1]. Iako nema metastatski potencijal, DCIS se smatra prekursorom invazivnog duktalnog karcinoma (engl. *invasive ductal carcinoma* – IDC) [1]. Studije pokazuju da 25–60% nelečenih slučajeva DCIS-a može da progredira u IDC [2].

Sa sve učestalijom primenom pošteđenih operacija dojke (engl. *breast-conserving surgery* – BCS), raste i potreba za preciznom stratifikacijom lezija koje imaju veću šansu da recidiviraju ili progrediraju u IDC. U cilju zadovoljenja ove potrebe, razvijeni su novi klasifikacioni sistemi, koji se prvenstveno zasnivaju na nuklearnom gradusu i prisustvu nekroze [3]. Nekoliko studija je potvrdilo kliničku relevantnost ovog pristupa, pokazujući da su visok nuklearni gradus i/ili prisustvo nekroze (posebno komedo-nekroze) povezani sa većim rizikom od ranog nastanka lokalnog recidiva [4,5].

Tokom poslednje decenije, stručne rasprave o najprikladnijem terapijskom pristupu DCIS-u su postale intenzivnije. Iako je hirurška resekcija uz adjuvantnu radioterapiju i dalje predstavlja standardnu terapijsku opciju, kontinuirano se vodi debata o tome da li se određene pacijentkinje, posebno one sa DCIS-om niskog gradusa i povoljnim biološkim karakteristikama, nepotrebno izlažu agresivnim modalitetima lečenja. U poslednje vreme aktivni nadzor se sve češće razmatra kao potencijalna opcija za ove pacijentkinje. Ipak, zbog potrebe za uravnoteženjem rizika od progresije i mogućnosti prekomernog lečenja indolentnih lezija, terapijski protokoli ostaju predmet stručnih debata [6].

Cilj ovog rada jeste da prikaže savremene dijagnostičke i terapijske pristupe DCIS-u, sa posebnim osvrtom na izazove u donošenju optimalnih kliničkih odluka.

DIJAGNOSTIKA

Anamneza i klinički pregled

Klinički pregled je obavezan pre započinjanja radiološke dijagnostike. U kontekstu naslednog rizika za DCIS, posebnu pažnju potrebno je posvetiti detaljnoj porodičnoj anamnezi. Nakon procene rizika, pacijentkinje se po potrebi upućuju na genetsko savetovanje. Nacionalna mreža za sveobuhvatnu borbu protiv raka (engl. *The National Comprehensive Cancer Network* – NCCN) preporučuje rutinsko testiranje ekspresije estrogenih receptora radi određivanja potencijalne koristi od adjuvantne hormonske terapije, dok testiranje na progesteronske receptore ostaje opciono [6].

INTRODUCTION

Ductal carcinoma in situ (DCIS) is a non-invasive form of breast cancer characterized by the proliferation of malignant epithelial cells within the ductal system, without breaching the basement membrane or infiltrating the surrounding tissue [1]. Although it does not have metastatic potential, DCIS is considered a precursor for invasive ductal carcinoma (IDC) [1]. Studies indicate that 25–60% of untreated DCIS cases may progress to IDC [2].

With the increasing implementation of breast-conserving surgery (BCS), there is an escalating necessity for accurate stratification of lesions with a higher likelihood of recurrence or progression into IDC. To address this need, new classification systems have been developed, primarily based on nuclear grade and the presence of necrosis [3]. Several studies have confirmed the clinical relevance of this approach, demonstrating that high nuclear grade and/or necrosis (especially comedo necrosis) are associated with an increased risk of early local recurrence [4,5].

Over the past decade, professional discussions have intensified regarding the most appropriate therapeutic approach to DCIS. While surgical resection with adjuvant radiotherapy remains the standard treatment option, an ongoing debate concerns whether certain patients (particularly those with low-grade DCIS and favorable biological characteristics) are being unnecessarily exposed to aggressive treatment modalities. Recently, active surveillance has increasingly been considered as a potential option for these patients. However, due to the need to balance the risk of progression against the potential overtreatment of indolent lesions, therapeutic protocols remain a matter of expert debate [6].

This paper aims to present current diagnostic and therapeutic approaches to DCIS, with special emphasis on the challenges of making optimal clinical decisions.

DIAGNOSIS

Anamnesis and Clinical Examination

A clinical examination is mandatory before the initiation of radiological diagnostic procedures. In the context of hereditary DCIS risk, particular attention should be given to detailed family history. Following risk assessment, patients should be referred for genetic counseling when indicated. *The National Comprehensive Cancer Network* (NCCN) recommends routine testing for estrogen receptor expression to determine the potential benefit of adjuvant hormonal therapy, while progesterone receptor testing remains optional [6].

Mamografija

Tokom rane faze implementacije skrininga, incidencija DCIS-a je porasla za više od 500% [7]. Danas DCIS čini 20–25% svih novodijagnostikovanih karcinoma dojke [8].

Mikrokalcifikacije predstavljaju najčešću mamografsku manifestaciju DCIS-a. Prema podacima Dershaw-a i sar., mamografijom se njihovo prisustvo detektuje u 98% slučajeva [9]. Slične nalaze izneli su i Stomper i sar., naglašavajući njihov karakterističan izgled [10]. U njihovoj studiji, kalcifikacije povezane sa DCIS-om opisane su kao pleomorfne, tipično grupisane i često raspoređene u linearne ili segmentne obrasce koji prate raspored mlečnih kanala. Ovi obrasci, karakteristični za maligne procese, pomažu u razlikovanju istih od kalcifikacija povezanih sa benignim promenama, koje su uglavnom okrugle i nasumično raspoređene [9,10].

Još jedan ključni aspekt preoperativne procene DCIS-a jeste procena rasprostranjenosti mikrokalcifikacija. Iako mamografija može pružiti dragocene informacije o njihovom prisustvu, često potcenjuje veličinu same lezije, naročito kod DCIS-a niskog i srednjeg gradusa. U studijama koje su koristile samo standardne bilateralne mamografske projekcije (mediolateralne i kraniokaudalne), veličina lezije bila je potcenjena i do 2 cm [11]. Pored toga, peritumoralna inflamacija i/ili fibroza takođe mogu dovesti do pogrešnog tumačenja mamografskih nalaza usled prisustva periduktalnih masa sa mikrokalcifikacijama, čak i u odsustvu invazije [12]. Stoga mamografija sama po sebi nije dovoljna za procenu tumorske invazije bazalne membrane, što je inače ključna razlika između DCIS-a i IDC-a. Radi smanjenja rizika od potcenjivanja lezije i pogrešnog tumačenja peritumoralnih promena, preporučuje se rutinska primena mamografije sa uvećanjem i/ili kompresijom [13].

Magnetna rezonanca (MRI)

Morfološki obrasci maligniteta uočeni na MRI-u slični su onima nađenim mamografijom. Najčešći nalaz jeste nenodularno pojačanje signala, grupisano ili linearno, koje prati duktalnu distribuciju u dojci [13,14].

Neke studije su pokazale da se osetljivost MRI-a za detekciju DCIS-a kreće u rasponu od 70–100% [15,16]. Senzitivnost iste varira u zavisnosti od histološkog tipa tumora, pri čemu je viša kod tumora visokog gradusa. Iako MRI ima visoku senzitivnost, njena specifičnost je niža i kreće se od 37–75% [17]. Niska specifičnost i veća stopa lažno pozitivnih rezultata mogu se pripisati benignim lezijama koje takođe pokazuju pojačanje signala na MRI-u. Neke studije su pokazale povećanje specifičnosti kada se uzmu u obzir kinetika pojačanja, budući da maligne lezije obično pokazuju rano i brzo pojačanje signala [18].

Mammography

During the early phase of screening implementation, the incidence of DCIS diagnoses increased by more than 500% [7]. Currently, DCIS accounts for 20–25% of all newly diagnosed breast cancer cases [8].

Microcalcifications represent the primary mammographic manifestation of DCIS. According to Dershaw *et al.*, mammography detected their presence in 98% of cases [9]. Similar findings were reported by Stomper *et al.*, who particularly emphasized their distinctive appearance [10]. In their study, calcifications associated with DCIS were described as pleomorphic, typically clustered, and often arranged in linear or segmental patterns following the distribution of breast ducts. These patterns, characteristic of malignant processes, help distinguish them from calcifications related to benign changes, which are generally round and randomly distributed [9,10].

Another key aspect of preoperative DCIS assessment is evaluating the extent of tumor microcalcifications. Although mammography can provide valuable information about their presence, it may underestimate lesion size, particularly in low- and intermediate-grade DCIS. In studies using only standard bilateral mammography in mediolateral and craniocaudal projections, lesion size was underestimated by as much as 2 cm [11]. Additionally, peritumoral inflammation and/or fibrosis may lead to misinterpretation of mammographic findings due to the presence of a periductal mass with microcalcifications, even in the absence of invasion [12]. Therefore, mammography alone is insufficient for determining whether the basement membrane has been breached, a distinction critical for differentiating DCIS from IDC. To minimize the risk of lesion underestimation and misinterpretation of peritumoral changes, the routine use of magnification or compression mammography is recommended [13].

Magnetic Resonance Imaging (MRI)

The morphological patterns of malignancy observed on MRI are similar to those seen on mammography. The most common finding is non-nodular enhancement, which may appear as clustered or linear, following the ductal distribution within the breast [13,14].

Some studies have demonstrated that MRI sensitivity for detecting DCIS ranges from 70–100% [15,16]. Sensitivity varies according to tumor histology, being higher in high-grade tumors. Although MRI sensitivity is high, its specificity is lower, ranging from 37–75% [17]. The low specificity and higher rate of false positives may be attributed to benign lesions that also exhibit enhancement on MRI. Some studies have shown improved specificity when enhancement kinetics are

Iako se MRI ne koristi rutinski kod svih pacijentkinja sa DCIS-om, ona može pružiti vredne informacije u preoperativnoj proceni rasprostranjenosti bolesti, kao i u detekciji istovremenih lezija u kontralateralnoj dojci.

Ultrazvuk

Na ultrazvuku se DCIS obično prikazuje kao hipoehogena lezija nepravilnog oblika i slabo definisanih ivica. Ove lezije obično ne pokazuju značajnu vaskularizaciju na Doppler-u, što pomaže u njihovom razlikovanju od IDC-a [19]. Ultrazvuk može igrati važnu ulogu u detekciji i proceni rasprostranjenosti DCIS-a kada su mamografski nalazi nejasni (npr. nekalcifikovane lezije, visoka gustina dojki). Yuan i sar. su pokazali da kombinacijom ove dve dijagnostičke metode dolazi do povećanja osetljivosti u detekciji DCIS-a za 10–15% [20].

Biopsija

Uprkos napretku u sferi dijagnostičkog imidžinga, konačna dijagnoza DCIS-a može se postaviti isključivo histopatološkom analizom uzoraka tkiva dobijenih biopsijom. Izbor metode biopsije zavisi od karakteristika same lezije, kao što su njena veličina, prisustvo mikrokalcifikacija i palpabilnost. Biopsiju treba izvoditi samo kada je indikovana, a na osnovu kliničkih i radioloških nalaza (BI-RADS 4–5), i nakon adekvatnog izbora metode [12].

Najčešće korišćene tehnike biopsije su biopsija iglom velikog promera (engl. *core needle biopsy* – CNB) i vakuum-asistirana biopsija (engl. *vacuum-assisted biopsy* – VAB), koje se izvode uz mamografsku, ultrazvučnu ili MRI navigaciju, u zavisnosti od vidljivosti same lezije [21,22].

Stereotaksična CNB je standardni pristup za nepalabilne mikrokalcifikacije otkrivene mamografijom, dok se biopsija vođena ultrazvukom preferira za sonografski vidljive lezije [22]. Kada perkutane metode nisu izvodljive ili ne obezbeđuju adekvatne uzorke, primenjuje se otvorena biopsija uz navođenje žicom, posebno kod difuznih ili duboko lociranih promena. Ova tehnika omogućava preciznu lokalizaciju i eksciziju sumnjivih lezija uz poštovanje onkoloških i estetskih principa [6].

Biopsija limfnog čvora stražara (engl. *sentinel lymph node biopsy* – SLNB)

Iako neki autori zagovaraju rutinsku SLNB kod pacijentkinja sa povećanim rizikom za IDC, drugi se protive ovom pristupu zbog niske učestalosti aksilarnih metastaza i visokih stopa preživljavanja kod pacijentkinja sa čistim DCIS-om (97–99%) [23]. NCCN preporučuje selektivnu primenu SLNB kod pacijentkinja koje su planirane za mastektomiju ili za BCS u regijama dojke koje bi mogle ugroziti normalnu limfnu drenažu aksile

considered, as malignant tumors typically display early and rapid signal enhancement [18].

Although MRI is not routinely utilized in all DCIS patients, it can provide valuable information in the preoperative assessment of disease extent and in detecting synchronous lesions in the contralateral breast.

Ultrasound (US)

On ultrasound, DCIS typically appears as a hypoechoic lesion with an irregular shape and poorly defined margins. These lesions usually do not exhibit significant vascularization on *Doppler* imaging, which helps distinguish them from IDC [19]. Ultrasound can play an essential role in detecting and assessing DCIS extent when mammographic findings are inconclusive (e.g., non-calcified lesions, high breast density). Yuan *et al.* demonstrated that combining these two modalities increases DCIS detection sensitivity by 10–15% [20].

Biopsy

Despite advancements in diagnostic imaging, definitive diagnosis of DCIS can only be established through histopathological analysis of tissue samples obtained via biopsy. The choice of biopsy method depends on lesion characteristics, such as size, presence of microcalcifications, and palpability. Biopsy should be performed only when indicated, based on clinical and radiological findings (BI-RADS categories 4–5), and following appropriate method selection [12].

The most commonly used techniques are core needle biopsy (CNB) and vacuum-assisted biopsy (VAB), performed under mammographic, ultrasound, or MRI guidance, depending on lesion visibility [21,22].

Stereotactic CNB is the standard approach for non-palpable microcalcifications detected via mammography, while ultrasound-guided biopsy is preferred for sonographically visible lesions [22]. When percutaneous methods are not feasible or yield inadequate samples, wire-guided open biopsy is utilized, especially for diffuse or deeply located changes. This technique allows accurate localization and excision of suspicious lesions while adhering to oncological and aesthetic principles [6].

Sentinel Lymph Node Biopsy (SLNB)

Although some authors advocate for routine SLNB in patients at increased risk of IDC, others oppose this approach due to the low incidence of axillary metastases and the high survival rates observed in patients with pure DCIS (97–99%) [23]. The NCCN recommends selective use of SLNB in patients scheduled for mastectomy or BCS in breast regions that could compromise normal axillary lymph drainage (e.g., upper outer

(npr. gornji spoljašnji kvadrant) [6]. U takvim slučajevima, SLNB treba razmotriti tokom primarne hirurške intervencije, jer se nakon mastektomije ne može izvesti. Zlatni standard za ovu proceduru jeste metoda dvostruke modalnosti, tj. upotreba radioaktivnog izotopa u kombinaciji sa metilenskim plavetnilom [24].

TERAPIJA

Poslednjih godina raste interesovanje za manje invazivne terapijske pristupe DCIS-u. Klinička ispitivanja kao što su *LORIS*, *LORD* i *COMET* istražuju aktivni nadzor kao alternativu hirurškom lečenju kod pažljivo odabranih pacijentkinja sa niskorizičnim oblicima bolesti [25–27]. Rani rezultati ovih studija ukazuju na terapijske ishode uporedive sa konvencionalnim načinom lečenja, barem na kratkoročnom nivou. Ipak, kod približno 20% pacijentkinja kod kojih je prvobitno dijagnostikovano niskorizično DCIS, nakon hirurške ekscizije je otkriven IDC [28]. Zbog toga, aktivni nadzor zahteva stroge kriterijume selekcije pacijentkinja i dosledno praćenje.

Radi bolje individualizacije lečenja, razvijeni su različiti prognostički alati koji pomažu u stratifikaciji rizika i donošenju adekvatnih terapijskih odluka. Među tradicionalnim alatima, *Van Nuys prognostički indeks* kombinuje veličinu tumora, širinu hirurške margine, nuklearni gradus i prisustvo komedo-nekroze, kako bi se procenio rizik od lokalnog recidiva i odredila optimalna strategija lečenja [29]. *DCIS nomogram* uključuje deset kliničko-patoloških faktora za preciznu procenu individualnog rizika od recidiva i donošenja odluka o radioterapiji, hormonskoj terapiji i adekvatnosti hirurških margina [30].

Sa napretkom molekularne onkologije, genomijski testovi sve više nalaze primenu u kliničkoj praksi. *Oncotype DX DCIS Score* kvantifikuje desetogodišnji rizik od recidiva nakon BCS bez radioterapije, a na osnovu ekspresije 12 gena, i time pomaže u odlučivanju o potrebi za zračenjem [31]. Slično tome, test *DCISionRT* integriše molekularne biomarkere (npr. *HER2*, progesteronski receptori, *Ki-67*, *p16*) sa kliničkim podacima kako bi se procenila potencijalna korist od adjuvantne radioterapije. Prema nekim studijama, ovaj test menja terapijski plan kod više od 30% pacijentkinja. Navedeni alati dopunjuju tradicionalne kliničko-patološke parametre i imaju potencijal da unaprede personalizaciju lečenja, naročito u smislu izbegavanja prekomernog lečenja kod niskorizičnih slučajeva [32].

Prema smernicama NCCN, osnovni modaliteti lečenja DCIS-a su [6]:

- 1) mastektomija,
- 2) BCS (sa ili bez adjuvantne WBRT – engl. *whole-breast radiotherapy*),
- 3) adjuvantna hormonska terapija.

quadrant) [6]. In such cases, SLNB should be considered during the initial surgery, as it cannot be performed after mastectomy. The gold standard for this procedure is the dual-modality method with radioactive isotope and blue-dye method [24].

THERAPY

In recent years, there has been growing interest in less invasive therapeutic approaches for DCIS. Clinical trials such as *LORIS*, *LORD*, and *COMET* are investigating active surveillance as an alternative to surgery for carefully selected patients with low-risk forms of the disease [25–27]. Early results from these studies suggest comparable therapeutic outcomes to conventional treatments, at least in the short term. However, approximately 20% of patients initially diagnosed with low-risk DCIS are found to have IDC upon surgical excision [28]. Therefore, active surveillance requires strict patient selection criteria and consistent follow-up.

To better individualize treatment, various prognostic tools have been developed to support risk stratification and therapeutic decision-making. Among the traditional models, the *Van Nuys Prognostic Index* combines tumor size, margin width, nuclear grade, and the presence of comedo necrosis to assess the risk of local recurrence and determine optimal treatment strategies [29]. The *DCIS nomogram* incorporates ten clinicopathological factors to provide a precise estimate of individual recurrence risk and to guide decisions regarding radiation therapy, hormonal therapy, and surgical margin adequacy [30].

With advancements in molecular oncology, genomic tests are increasingly entering clinical practice. The *Oncotype DX DCIS Score* quantifies the ten-year risk of recurrence following BCS without radiotherapy, based on the expression of 12 genes, thereby assisting in decisions regarding the need for radiation [31]. Similarly, *DCISionRT* integrates molecular biomarkers (e.g., *HER2*, progesterone receptors, *Ki-67*, *p16*) with clinical data to assess the potential benefit of adjuvant radiotherapy. According to some studies, this test modifies the therapeutic plan in more than 30% of patients. These tools complement traditional clinicopathological parameters and have the potential to enhance treatment personalization, particularly by helping to avoid overtreatment in low-risk cases [32].

According to NCCN guidelines, the primary treatment modalities for DCIS are [6]:

- 1) mastectomy,
- 2) BCS (with or without adjuvant whole-breast radiotherapy - WBRT), and
- 3) adjuvant hormonal therapy.

Mastektomija

Studije ukazuju da se oko 95% pacijentkinja sa DCIS-om podvrgava hirurškom lečenju, pri čemu se kod jedne trećine sprovodi mastektomija [33]. Dugoročni rizik od lokalnog recidiva nakon mastektomije je veoma nizak i iznosi 1–2%, u poređenju sa 3–10% kod žena lečenih kombinacijom BCS i WBRT [6]. Važno je napomenuti da ova razlika u riziku od recidiva ne utiče na dugoročno preživljavanje (nakon 20 godina), koje ostaje visoko u obe grupe (97–99%) [34,35].

Glavne indikacije za mastektomiju kod DCIS-a uključuju: (I) multifokalnost i/ili opsežnu rasprostranjenost lezije (u dva ili više kvadranta dojke), (II) visok nuklearni gradus, (III) nemogućnost postizanja čistih hirurških margina nakon BCS, (IV) starost ispod 40 godina, (V) prethodno zračenje dojke, i (VI) kontraindikacije za radioterapiju [6].

Savremena hirurgija dojke razvila se u pravcu estetski prihvatljivih pristupa, koji čuvaju estetski integritet dojke uz poštovanje onkoloških principa. Tehnike kao što su *mastektomija sa očuvanjem kože* i *mastektomija sa očuvanjem bradavice* zadovoljavaju ove kriterijume i danas predstavljaju zlatni standard kada je potrebna radikalna, ali tkivo-poštedna intervencija [6].

Uloga postmastektomijske radioterapije (engl. *postmastectomy radiation therapy – PMRT*) kod DCIS-a do danas ostaje kontroverzna i ograničena, jer ni u jednoj specifičnoj grupi pacijentkinja nije dokazan jasan klinički benefit. Samo mali broj visokorizičnih pacijentkinja (npr. sa opsežnom bolešću, tumorima visokog gradusa ili pozitivnim marginama) mogu biti podvrgnute PMRT [36].

BCS sa ili bez adjuvantne WBRT

Trenutno se oko 60–75% novodijagnostikovanih slučajeva DCIS-a leči BCS-om, sa ili bez WBRT [1,33]. Prema smernicama NCCN-a, BCS je odgovarajući izbor kod unifokalnih lezija (ograničenih na jedan kvadrant dojke), kada se mogu postići negativne hirurške margine od najmanje 2 mm. Smernice takođe preporučuju adjuvantnu WBRT kada god je to izvodljivo. U određenim slučajevima, kao što su male ($\leq 2,5$ cm), niskogradusne lezije sa negativnim marginama (obično ≥ 2 mm), ili kada postoji kontraindikacija za radioterapiju, može se razmatrati samo BCS bez radioterapije [6].

Kombinacija BCS i WBRT je detaljno proučavana, a brojne kliničke studije su potvrdile njenu efikasnost i superiornost u odnosu na BCS bez WBRT. **Tabela 1.** prikazuje rezultate šest prospektivnih, randomizovanih studija koja su upoređivale stopu recidiva DCIS-a i IDC-a kod pacijentkinja lečenih isključivo BCS (kontrolna grupa) u odnosu na one koje su lečene BCS uz adjuvantnu WBRT (eksperimentalna grupa) [37–42].

Mastectomy

Studies indicate that approximately 95% of patients with DCIS undergo surgical excision, with one-third of them receiving a mastectomy [33]. The long-term risk of local recurrence after mastectomy is very low, ranging from 1–2%, compared to 3–10% among women treated with BCS and WBRT [6]. Notably, this difference in recurrence risk does not affect long-term survival (after 20 years), which remains high in both groups (97–99%) [34,35].

The main indications for mastectomy in DCIS include: (I) multifocality and/or extensive lesion distribution (in two or more breast quadrants), (II) high nuclear grade, (III) inability to achieve clear surgical margins after BCS, (IV) age under 40 years, (V) prior breast irradiation, and (VI) contraindications to radiotherapy [6].

Modern breast surgery has evolved towards aesthetic approaches that preserve aesthetic integrity while adhering to oncological principles. Techniques such as *skin-sparing* mastectomy and *nipple-sparing* mastectomy meet these criteria and are now the gold standard when a radical, tissue-preserving intervention is required [6].

The role of post-mastectomy radiation therapy (PMRT) in DCIS remains controversial and limited, as no specific patient group has demonstrated consistent clinical benefit. Only a small subset of high-risk patients (e.g., those with extensive disease, high-grade tumors, or positive margins) may be considered for PMRT [36].

BCS with or without WBRT

Currently, approximately 60–75% of newly diagnosed DCIS cases are treated with BCS, with or without WBRT [1,33]. According to NCCN guidelines, BCS is appropriate for unifocal lesions (limited to a single breast quadrant) when negative surgical margins of at least 2 mm can be achieved. The guidelines also recommend adjuvant WBRT whenever feasible. In some instances, such as small (≤ 2.5 cm), low-grade lesions with negative margins (usually ≥ 2 mm), or when radiation is contraindicated, BCS alone may be considered [6].

The combination of BCS and WBRT has been extensively studied, and numerous clinical trials have confirmed its efficacy and superiority over BCS alone. **Table 1** presents results from six prospective randomized trials comparing DCIS and IDC recurrence rates in patients treated with BCS alone (control group) vs. BCS with adjuvant WBRT (experimental group) [37–42]. The results consistently demonstrate that the combined approach leads to significantly lower recurrence rates, ranging from 3.0–9.3%, compared to 7.0–19.2% in the control groups.

Tabela 1. Tabelarni prikaz prospektivnih studija koje su upoređivale efikasnost BCS i WBRT (eksperimentalna grupa) naspram BCS bez WBRT (kontrolna grupa) [37–42]

Studija / Study	Dizajn / Design	Medijana praćenja / Median follow-up	Recidiv DCIS-a / DCIS recurrence	
			Exp. gr. / Exp. gr.	Kont. gr. / Cont. gr.
UKCCCR (37)	prospektivna / randomizirana / prospective, randomized	4.5 godina / years	3%	7%
EORTC 10853 (38)	prospektivna / randomizirana / prospective, randomized	10 godina / years	7%	14%
SweDCIS (39)	prospektivna / randomizirana / prospective, randomized	7 godina / years	9.3%	19.2%
UK/ANZ DCIS (40)	prospektivna / randomizirana / prospective, randomized	10 godina / years	5%	16%
NSABP B-17 (41)	prospektivna / randomizirana / prospective, randomized	15 godina / years	8.8%	15.7%
NRG/TOG 980 * (42)	prospektivna / randomizirana / prospective, randomized	13.9 godina / years	7.1%	15.1%

Legenda: * DCIS i IDC zajedno**Table 1.** Tabular presentation of prospective studies comparing the efficacy of BCS and WBRT (experimental group) versus BCS without WBRT (control group) [37–42]**Legend:** * DCIS and IDC together.

Rezultati dosledno pokazuju da kombinovani pristup vodi ka značajno nižim stopama recidiva, koje su u rasponu od 3,0–9,3%, naspram 7,0–19,2% u kontrolnim grupama.

Neke studije su takođe ispitivale i dugoročno preživljavanje pacijentkinja sa DCIS-om koje su lečene isključivo BCS-om naspram onih koje su lečene BCS uz WBRT. Stope preživljavanja ostale su veoma visoke u obe grupe (97–99%) bez značajnih razlika između istih [41,42]. Dakle, iako adjuvantna WBRT smanjuje rizik od lokalnog recidiva, ona ne utiče na samo preživljavanje, koje ostaje podjednako visoko u oba slučaja.

Hirurške margine

Hirurške margine se naširoko smatraju najvažnijim aspektom patohistološke analize tkivnih uzoraka nakon hirurške ekscizije DCIS-a. Do sada nije postignut profesionalni konsenzus po ovom pitanju, verovatno zbog kontradiktornih rezultata različitih studija. Retrospektivna studija koja je obuhvatila 445 pacijentkinja podvrgnutih BCS zbog čistog DCIS-a potvrdila je da širina hirurških margina ostaje najznačajniji nezavisni prediktor pojave lokalnog recidiva [43]. Meta-analiza koju su objavili Dunne i sar. 2009. godine potvrdila je da su pacijentkinje sa negativnim hirurškim marginama (nakon BCS i adjuvantne WBRT) imale za 64% manji rizik od pojave recidiva u poređenju sa onima sa pozitivnim marginama [44]. Ista studija je takođe pokazala da su margine < 2 mm povezane sa značajno većim rizikom od recidiva nego margine > 2 mm, iako nije utvrđena statistički značajna razlika u stopama recidiva između margina ≤ 5 mm i onih od tačno 2 mm [44]. Aktuelne smerinice koje su zajednički objavili Udruže-

Some studies have also examined long-term survival among DCIS patients treated with BCS alone vs. BCS with WBRT. Survival rates remained very high (97–99%) and did not differ significantly between the two groups [41,42]. Therefore, while adjuvant WBRT reduces the risk of local recurrence, it does not impact overall survival, which remains equally high in both treatment strategies.

Surgical Margins

Assessment of surgical margins is widely regarded as the most critical aspect of the pathological evaluation of tissue specimens following surgical excision of DCIS. To date, no professional consensus has been established on this matter, likely due to conflicting findings across various studies.

A retrospective study involving 445 patients who underwent BCS for pure DCIS demonstrated that margin width is the most significant independent predictor of local recurrence [43]. A meta-analysis published by Dunne *et al.* in 2009 confirmed that patients with negative surgical margins (following BCS and adjuvant WBRT) had a 64% lower risk of recurrence compared to those with positive margins [44]. The same study also found that margins < 2 mm were associated with a significantly higher risk of recurrence than margins > 2 mm, although no statistically significant difference in recurrence rates was observed between margins ≤ 5 mm and those measuring exactly 2 mm [44]. Current guidelines from the *Society of Surgical Oncology* (SSO), *American Society for Radiation Oncology* (ASTRO), and *American Society of Clinical Oncology* (ASCO) recommend excision with at least 2 mm margins followed by

nje onkoloških hirurga (engl. *Society of Surgical Oncology – SSO*), Američko udruženje radijacionih onkologa (engl. *American Society for Radiation Oncology – ASTRO*) i Američko udruženje kliničkih onkologa (engl. *American Society of Clinical Oncology – ASCO*) preporučuju eksciziju DCIS-a sa marginama od minimum 2 mm, uz adjuvantnu WBRT radi minimizacije rizika od nastanka lokalnog recidiva [45].

Ubrzana parcijalna iradijacija dojke (engl. *accelerated partial breast irradiation – APBI*)

APBI predstavlja skraćeni oblik radioterapije koji cilja samo deo dojke gde se nalazila tumorska lezija. Ovaj pristup smanjuje izloženost zdravog tkiva zračenju, skraćuje trajanje terapije i može doprineti očuvanju kvaliteta života pacijentkinje bez ugrožavanja onkološke bezbednosti [6].

Prema ASTRO smernicama, kandidatkinje za APBI su pacijentkinje sa DCIS-om otkrivenim skriningom, veličine tumora $\leq 2,5$ cm, gradusa I–II, sa hirurškim marginama ≥ 3 mm [45].

Četiri prospektivne studije su pokazale da je APBI efikasan kao i WBRT u postizanju lokalne kontrole bolesti, uz isti profil toksičnosti, ali povoljniji kozmetički ishod [46–49].

Radioterapijski “boost”

Radioterapijski “boost” predstavlja dodatnu, lokalizovanu dozu zračenja koja se primenjuje na mesto tumora nakon WBRT [50]. Ovaj pristup se preporučuje pacijentkinjama sa negativnim hirurškim marginama i povećanim biološkim rizikom (tumori visokog gradusa, prisustvo komedo nekroze, ili mlađa životna dob). Studije su pokazale da ovaj pristup može da dovede do značajnog smanjenja rizika od lokalnog recidiva – i do 27% [50].

Hormonska terapija

Adjuvantna hormonska terapija je indicirana kod pacijentkinja sa DCIS-om pozitivnim na estrogenske i/ili progesteronske receptore, a nakon široke lokalne ekscizije tumora, sa ili bez primene adjuvantne radioterapije.

Za ovu svrhu koriste se dve glavne grupe lekova [6]:

- 1) selektivni modulatori estrogenskih receptora (tamoksifen),
- 2) inhibitori aromataze (anastrozol).

Tamoksifen je selektivni modulator estrogenskih receptora koji se primenjuje u standardnoj dozi od 20 mg dnevno tokom pet godina. Deluje tako što blokira estrogenske receptore u tkivu dojke, sprečavajući hormonski stimulisanu proliferaciju tumorskih ćelija [51]. Njegova

adjuvant WBRT as the optimal strategy for minimizing local recurrence rates [45].

Accelerated Partial Breast Irradiation (APBI)

APBI is a shortened form of radiotherapy that targets only the portion of the breast where the lesion was located. This approach reduces radiation exposure to healthy tissue, shortens the duration of therapy, and may help preserve patient quality of life without compromising oncologic safety [6].

According to ASTRO guidelines, candidates for APBI include patients with screen-detected DCIS measuring ≤ 2.5 cm, grade I–II, and with surgical margins ≥ 3 mm [45].

Four prospective studies have demonstrated that APBI is effective as WBRT in achieving local disease control, with a comparable toxicity profile and improved cosmetic outcomes [46–49].

Radiotherapy Boost

A radiotherapy boost refers to an additional, localized dose of radiation delivered to the tumor bed, following WBRT [50]. This approach is recommended for patients with negative surgical margins but elevated biological risk factors, such as high-grade tumors, the presence of comedo necrosis, or young age. Studies have demonstrated a significant reduction in local recurrence risk by up to 27% [50].

Hormonal Therapy

Adjuvant hormonal therapy is indicated for patients with estrogen and/or progesterone-receptor-positive DCIS following wide local excision, with or without radiotherapy.

Two main classes of drugs are used for this purpose [6]:

- 1) selective estrogen receptor modulators (tamoxifen), and
- 2) aromatase inhibitors (anastrozole).

Tamoxifen is a selective estrogen receptor modulator administered at a standard dose of 20 mg per day for five years. It works by blocking estrogen receptors in breast tissue, thereby preventing hormone-induced stimulation of tumor cell proliferation [51]. Its efficacy in reducing the risk of local recurrence has been evaluated in several major clinical trials (Table 2) [37,40,41]. The NSABP B-24 study showed that tamoxifen, compared to placebo, reduced the 10-year DCIS recurrence rate from 7.2% to 5.6% [41]. Overall survival did not differ significantly between the groups. Similar results have been reported in other studies addressing this topic [37,40].

Anastrozole, an aromatase inhibitor, reduces systemic estrogen levels by inhibiting the conversion of

Tabela 2. Tabelarni prikaz prospektivnih studija koje su upoređivale efikasnost BCS, WBRT i tamoksifena (eksperimentalna grupa) naspram BCS, WBRT i placebo (kontrolna grupa) [37,40,41]

Studija / Study	Dizajn / Design	Medijana praćenja / Median follow-up	Recidiv DCIS-a / DCIS recurrence	
			Exp. gr. / Exp. gr.	Kont. gr. / Cont. gr.
UKCCCR (37)	prospektivna / randomizirana / prospective, randomize	4.5 godina / years	1%	1%
UK/ANZ DCIS (40)	prospektivna / randomizirana / prospective, randomize	10 godina / years	3%	5%
NSABP B-24 (41)	prospektivna / randomizirana / prospective, randomize	10 godina / years	5.6%	7.2%

Table 2. Tabular presentation of prospective studies comparing the efficacy of BCS with WBRT, and tamoxifen (experimental group) versus BCS with WBRT, and placebo (control group) [37,40,41]**Tabela 3.** Tabelarni prikaz prospektivnih studija koje su upoređivale efikasnost BCS, WBRT i anastrozola (eksperimentalna grupa) naspram BCS, WBRT i tamoksifena (kontrolna grupa) [51,52]

Studija / Study	Dizajn / Design	Medijana praćenja / Median follow-up	Recidiv DCIS-a / DCIS recurrence	
			Exp. gr. / Exp. gr.	Kont. gr. / Cont. gr.
NSABP B-35 (51)	prospektivna / randomizirana / prospective, randomize	10 godina / years	0.9%	1.1%
IBIS-II DCIS (52)	prospektivna / randomizirana / prospective, randomize	7.5 godina / years	1%	2%

Table 3. Tabular presentation of prospective studies comparing the efficacy of BCS with WBRT, and anastrozole (experimental group) versus BCS with WBRT, and tamoxifen (control group) [51,52]

efikasnost u smanjenju rizika od lokalnog recidiva ispitivana je u nekoliko velikih kliničkih studija (Tabela 2) [37,40,41]. Studija NSABP B-24 je pokazala da je tamoksifen, u poređenju sa placebo, smanjio stopu recidiva DCIS-a u periodu od 10 godina sa 7,2% na 5,6% [41]. Ukupno preživljavanje nije se značajno razlikovalo između grupa. Slični rezultati prijavljeni su i u drugim studijama koje su se bavile ovom problematikom [37,40].

Anastrozol, inhibitor aromataze, smanjuje nivoe sistemskog estrogena inhibirajući konverziju androgena u estradiol. Obično se propisuje u dozi od 1 mg dnevno tokom pet godina [51].

Studije koje su upoređivale efikasnost tamoksifena i anastrozola, uključujući NSABP B-35 i IBIS-II studiju, pokazale su sličnu efikasnost u prevenciji recidiva (Tabela 3) [51,52]. Iako je ukupna učestalost neželjenih efekata bila slična, njihovi profili neželjenih efekata su se razlikovali – frakture su bile češće kod anastrozola, dok su vazomotorni simptomi i troboze bile češće kod tamoksifena.

Zaključno, i tamoksifen i anastrozol imaju značajnu ulogu u prevenciji recidiva DCIS-a. Izbor samog agensa treba individualizovati u skladu sa karakteristikama pacijentkinje, uključujući njen menopauzalni status i podnošljivost potencijalnih neželjenih efekata. Tamoksifen je terapijski izbor kod premenopauzalnih žena, dok se primena anastrozola može razmotriti kod postmenopauzalnih žena, s obzirom na sličnu efikasnost, ali drugačiji profil toksičnosti.

androgens to estradiol. It is typically prescribed at a dose of 1 mg daily for five years [51].

Comparative studies between tamoxifen and anastrozole, including NSABP B-35 and IBIS-II, have shown similar effectiveness in recurrence prevention (Table 3) [51,52]. Although the overall rate of adverse events was comparable, the side effect profiles differed - fractures were more common with anastrozole. In contrast, vasomotor symptoms and thrombotic events were more frequent with tamoxifen.

In conclusion, both tamoxifen and anastrozole play a significant role in preventing DCIS recurrence. The choice of agent should be individualized based on patient characteristics, including menopausal status and tolerance to potential side effects. Tamoxifen is the preferred option for premenopausal women, while anastrozole may be considered for postmenopausal women due to similar efficacy and a different toxicity profile.

CONCLUSION

Despite its generally favorable prognosis, DCIS requires a careful and well-considered diagnostic and therapeutic approach. The combination of BCS and adjuvant WBRT remains the most reliable strategy for reducing the risk of local recurrence, while the addition of hormonal therapy and radiotherapy boost can further improve outcomes, particularly among younger patients. In carefully selected low-risk cases, APBI may

ZAKLJUČAK

Uprkos generalno povoljnoj prognozi, DCIS zahteva pažljiv i promišljen dijagnostički i terapijski pristup. Kombinacija BCS i adjuvantne WBRT ostaje najpouzdanija strategija za smanjenje rizika od nastanka lokalnog recidiva, dok dodatak hormonske terapije i radioterapijskog "boosta" može dodatno poboljšati ishod lečenja, naročito kod mlađih pacijentkinja. Kod pažljivo odabranih pacijentkinja sa niskim rizikom, APBI se može razmatrati kao efikasna alternativa WBRT, pružajući uporedivu onkološku sigurnost uz povoljniji estetski rezultat.

Iako aktivni nadzor još uvek nije deo standardne kliničke prakse, ohrabrujući rezultati nedavnih studija ukazuju na njegov mogući značaj u zbrinjavanju pažljivo selektovanih pacijentkinja, pod uslovom da su primenjeni strogi kriterijumi selekcije.

Lečenje DCIS-a treba biti individualizovano i vođeno kombinacijom kliničkih, radioloških i patoloških faktora, uz aktivno učešće pacijentkinje u procesu zajedničkog donošenja odluka.

Buduća istraživanja treba da budu usmerena na validaciju molekularnih markera koji mogu pouzdano razlikovati indolentne od agresivnih oblika DCIS-a, čime bi se popravilo personalizovano lečenje, uz očuvanje kvaliteta života.

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LITERATURA / REFERENCES

- Hophan SL, Odnokoz O, Liu H, Luo Y, Khan S, Gradishar W, et al. Ductal carcinoma in situ of breast: from molecular etiology to therapeutic management. *Endocrinology*. 2022;163(4):bqac027. doi: 10.1210/endo/bqac027.
- Collins LC, Tamimi RM, Baer HJ, Connolly JL, Colditz GA, Schnitt SJ. Outcome of patients with ductal carcinoma in situ untreated after diagnostic biopsy: results from the Nurses' Health Study. *Cancer*. 2005;103(9):1778-84. doi: 10.1002/cncr.20979.
- Strand SH, Rivero-Gutiérrez B, Houlahan KE, Seoane JA, King LM, Risom T, et al. Molecular classification and biomarkers of clinical outcome in breast ductal carcinoma in situ: Analysis of TBCRC 038 and RAHBT cohorts. *Cancer Cell*. 2022;40(12):1521-36.e7. doi: 10.1016/j.ccell.2022.10.021.
- Murata T, Yoshida M, Shiino S, Watase C, Ogawa A, Shikata S, et al. Assessment of nuclear grade-based recurrence risk classification in patients with hormone receptor-positive, human epidermal growth factor receptor 2-negative, node-positive high-risk early breast cancer. *Breast Cancer*. 2023;30(6):1054-64. doi: 10.1007/s12282-023-01500-2.
- Chen J, Li Z, Han Z, Kang D, Ma J, Yi Y, et al. Prognostic value of tumor necrosis based on the evaluation of frequency in invasive breast cancer. *BMC Cancer*. 2023;23(1):530. doi: 10.1186/s12885-023-10943-x.
- National Comprehensive Cancer Network. NCCN Guidelines. Ductal carcinoma in situ [Internet]. Available from: <https://nccn.org/view/journals/jnccn/20/6/article-p691.xml>. Accessed: 2025 Apr 12.
- White E, Lee CY, Kristal AR. Evaluation of the increase in breast cancer incidence in relation to mammography use. *J Natl Cancer Inst*. 1990;82(19):1546-52. doi: 10.1093/jnci/82.19.1546.
- Howlader N, Noone AM, Krapcho M, Miller D, Brest A, Yu M, et al. SEER cancer statistics review, 1975–2018 [Internet]. Bethesda, MD: National Cancer Institute; 2021. Available from: http://seer.cancer.gov/csr/1975_2018. Accessed: 2025 Apr 17.
- Dershaw DD, Abramson A, Kinne DW. Ductal carcinoma in situ: mammographic findings and clinical implications. *Radiology*. 1989;170(2):411-5. doi: 10.1148/radiology.170.2.2536185.
- Stomper PC, Connolly JL, Meyer JE, Harris JR. Clinically occult ductal carcinoma in situ detected with mammography: analysis of 100 cases with radiologic-pathologic correlation. *Radiology*. 1989;172(1):235-41. doi: 10.1148/radiology.172.1.2544922.
- Paquet JR, Hendrick RE. Lesion size inaccuracies in digital mammography. *AJR Am J Roentgenol*. 2010;194(1):W115-8. doi: 10.2214/AJR.09.2927.
- D'Alfonso TM, Ginter PS, Shin SJ. A review of inflammatory processes of the breast with a focus on diagnosis in core biopsy samples. *J Pathol Transl Med*. 2015;49(4):279-87. doi: 10.4132/jptm.2015.06.11.
- Fallenberg EM, Dimitrijevic L, Diekmann F, Diekmann S, Kettritz U, Poellinger A, et al. Impact of magnification views on the characterization of microcalcifications in digital mammography. *Rofo*. 2014;186(3):274-80. doi: 10.1055/s-0033-1350572.
- Uslu H, Tosun M, Arslan AS. Non-mass enhancement of breast MRI: The comparison of benign and malignant pathological diagnosis and association of internal enhancement pattern and distribution with breast cancer molecular sub-types. *Acta Medica Nicomedia*. 2022;5(3):165–71. doi: 10.5336/actamednicomedia.2022-1128352.

be considered an effective alternative to WBRT, offering comparable oncologic control with superior cosmetic results.

Although active surveillance has not yet been incorporated into standard clinical practice, encouraging findings from recent studies suggest that it may have a role in the management of carefully selected patients, provided that strict selection criteria are applied.

Treatment of DCIS should be individualized and guided by a combination of clinical, radiological, and pathological factors, with active patient involvement in shared decision-making.

Future research should aim to validate molecular markers that can reliably distinguish indolent from aggressive forms of DCIS, thereby enabling truly personalized treatment while preserving quality of life.

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15. Endrikat J, Schmidt G, Haverstock D, Weber O, Trnkova ZJ, Barkhausen J. Sensitivity of contrast-enhanced breast MRI vs X-ray mammography based on cancer histology, tumor grading, receptor status, and molecular subtype: a supplemental analysis of 2 large phase III studies. *Breast Cancer (Auckl)*. 2022;16:11782234221092155. doi: 10.1177/11782234221092155.
16. Amitai Y, Menes TS, Scaranelo A, Fleming R, Kulkarni S, Ghai S, et al. The characteristics associated with upgrade on surgical pathology of conventional imaging occult DCIS diagnosed by MRI. *Breast Cancer Res Treat*. 2021;190(2):317-27. doi: 10.1007/s10549-021-06372-8.
17. Boné B, Aspelin P, Bronge L, Isberg B, Perbeck L, Veress B. Sensitivity and specificity of MR mammography with histopathological correlation in 250 breasts. *Acta Radiol*. 1996;37(2):208-13. doi: 10.1177/02841851960371P143.
18. Yao Y, Mou F, Kong J, Liu X. Kinetic heterogeneity improves the specificity of dynamic enhanced MRI in differentiating benign and malignant breast tumours. *Acad Radiol*. 2024;31(3):812-21. doi: 10.1016/j.acra.2023.10.006.
19. Cha H, Chang YW, Lee EJ, Hwang JY, Kim HJ, Lee EH, et al. Ultrasonographic features of pure ductal carcinoma in situ of the breast: correlations with pathologic features and biological markers. *Ultrasonography*. 2018;37(4):307-14. doi: 10.14366/usg.17039.
20. Yuan WH, Hsu HC, Chen YY, Wu CH. Supplemental breast cancer-screening ultrasonography in women with dense breasts: a systematic review and meta-analysis. *Br J Cancer*. 2020;123(4):673-88. doi: 10.1038/s41416-020-0928-1.
21. Kettritz U. Modern concepts of ductal carcinoma in situ (DCIS) and its diagnosis through percutaneous biopsy. *Eur Radiol*. 2008;18(2):343-50. doi: 10.1007/s00330-007-0753-4.
22. Alexander N, Viljoen I, Lucas S. Stereotactic breast biopsies: radiological-pathological concordance in a South African referral unit. *SA J Radiol*. 2022;26(1):2463. doi: 10.4102/sajr.v26i1.2463.
23. Davey MG, O'Flaherty C, Cleere EF, Nohilly A, Phelan J, Ronane E, et al. Sentinel lymph node biopsy in patients with ductal carcinoma in situ: systematic review and meta-analysis. *BJS Open*. 2022;6(2):zrac022. doi: 10.1093/bjsopen/zrac022.
24. Zdravkovic D, Loboda B, Gojgic M, Toskovic B. Techniques for sentinel lymph node biopsy in breast cancer patients. *Medicinska istraživanja*. 2025;58(1):83-87. doi: 10.5937/medi58-54885.
25. Francis A, Thomas J, Fallowfield L, Wallis M, Bartlett JM, Brookes C, et al. Addressing overtreatment of screen detected DCIS: the LORIS trial. *Eur J Cancer*. 2015;51(16):2296-303. doi: 10.1016/j.ejca.2015.07.017.
26. Schmitz RSJM, Engelhardt EG, Gerritsma MA, Sondermeijer CMT, Verschuur E, Houtzager J, et al. Active surveillance versus treatment in low-risk DCIS: Women's preferences in the LORD-trial. *Eur J Cancer*. 2023;192:113276. doi: 10.1016/j.ejca.2023.113276.
27. Hwang ES, Hyslop T, Lynch T, Frank E, Pinto D, Basila D, et al. The COMET (Comparison of Operative versus Monitoring and Endocrine Therapy) trial: a phase III randomised controlled clinical trial for low-risk ductal carcinoma in situ (DCIS). *BMJ Open*. 2019;9(3):e026797. doi: 10.1136/bmjopen-2018-026797.
28. Chavez de Paz Villanueva C, Bonev V, Senthil M, Solomon N, Reeves ME, Garberoglio CA, et al. Factors associated with underestimation of invasive cancer in patients with ductal carcinoma in situ: precautions for active surveillance. *JAMA Surg*. 2017;152(11):1007-14. doi: 10.1001/jamasurg.2017.2181.
29. Silverstein MJ, Lagios MD. Treatment selection for patients with ductal carcinoma in situ (DCIS) of the breast using the University of Southern California/Van Nuys (USC/VNPI) prognostic index. *Breast J*. 2015;21(2):127-32. doi: 10.1111/tbj.12368.
30. Martins Maia C, Siderides C, Jaffer S, Weltz C, Cate S, Ahn S, et al. Mastectomy or margin re-excision? A nomogram for close/positive margins after lumpectomy for DCIS. *Ann Surg Oncol*. 2022;29(6):3740-48. doi: 10.1245/s10434-021-11293-3.
31. Solin LJ, Gray R, Baehner FL, Butler SM, Hughes LL, Yoshizawa C, et al. A multigene expression assay to predict local recurrence risk for ductal carcinoma in situ of the breast. *J Natl Cancer Inst*. 2013;105(10):701-10. doi: 10.1093/jnci/djt067.
32. Bremer T, Whitworth PW, Patel R, Savala J, Barry T, Lyle S, et al. A biological signature for breast ductal carcinoma in situ to predict radiotherapy benefit and assess recurrence risk. *Clin Cancer Res*. 2018;24(23):5895-901. doi: 10.1158/1078-0432.CCR-18-0842.
33. Sagara Y, Mallory MA, Wong S, Aydogan F, DeSantis S, Barry WT, et al. Survival benefit of breast surgery for low-grade ductal carcinoma in situ: a population-based cohort study. *JAMA Surg*. 2015;150(8):739-45. doi: 10.1001/jamasurg.2015.0876.
34. Pan K, Nelson RA, Chlebowski RT, Piela R, Mullooly M, Simon MS, et al. Ductal carcinoma in situ and cause-specific mortality among younger and older postmenopausal women: the Women's Health Initiative. *Breast Cancer Res Treat*. 2024;207(1):65-79. doi: 10.1007/s10549-024-07327-5.
35. Nelson RA, Lai LL, Mortimer JE, Soto Perez De Celis E, Chlebowski RT, Kruper L. Prior DCIS and overall mortality in women with stage I breast cancer. *Journal of Clinical Oncology*. 2021;39(15_suppl):e12593-3. doi: 10.1200/JCO.2021.39.15_suppl.e12593.
36. Whitworth PW, Shah C, Vicini F, Rabinovitch R, Margenthaler JA, Warnberg F, et al. Identification of patients with DCIS with low-risk clinicopathology who benefit from radiation therapy with and without endocrine therapy after breast-conserving surgery assessed with the 7-gene biosignature. *Journal of Clinical Oncology*. 2024;42(16_suppl):528-8. doi: 10.1200/JCO.2024.42.16_suppl.528.
37. Houghton J, George WD, Cuzick J, Duggan C, Fentiman IS, Spittle M, et al. Radiotherapy and tamoxifen in women with completely excised ductal carcinoma in situ of the breast in the UK, Australia, and New Zealand: randomised controlled trial. *Lancet*. 2003;362(9378):95-102. doi: 10.1016/S0140-6736(03)13859-7.
38. EORTC Breast Cancer Cooperative Group, EORTC Radiotherapy Group, Bijker N, Meijnen P, Peterse JL, Bogaerts J, et al. Breast-conserving treatment with or without radiotherapy in ductal carcinoma-in-situ: ten-year results of European Organisation for Research and Treatment of Cancer randomized phase III trial 10853--a study by the EORTC Breast Cancer Cooperative Group and EORTC Radiotherapy Group. *J Clin Oncol*. 2006;24(21):3381-7. doi: 10.1200/JCO.2006.06.1366.
39. Wärnberg F, Garmo H, Emdin S, Hedberg V, Adwall L, Sandelin K, et al. Effect of radiotherapy after breast-conserving surgery for ductal carcinoma in situ: 20 years follow-up in the randomized SweDCIS trial. *J Clin Oncol*. 2014;32(32):3613-8. doi: 10.1200/JCO.2014.56.2595.
40. Cuzick J, Sestak I, Pinder SE, Ellis IO, Forsyth S, Bundred NJ, et al. Effect of tamoxifen and radiotherapy in women with locally excised ductal carcinoma in situ: long-term results from the UK/ANZ DCIS trial. *Lancet Oncol*. 2011;12(1):21-9. doi: 10.1016/S1470-2045(10)70266-7.
41. Wapnir IL, Dignam JJ, Fisher B, Mamounas EP, Anderson SJ, Julian TB, et al. Long-term outcomes of invasive ipsilateral breast tumor recurrences after lumpectomy in NSABP B-17 and B-24 randomized clinical trials for DCIS. *J Natl Cancer Inst*. 2011;103(6):478-88. doi: 10.1093/jnci/djr027.
42. McCormick B, Winter KA, Woodward W, Kuerer HM, Sneige N, Rakovitch E, et al. Randomized phase III trial evaluating radiation following surgical excision for good-risk ductal carcinoma in situ: long-term report from NRG oncology/ RTOG 9804. *J Clin Oncol*. 2021;39(32):3574-82. doi: 10.1200/JCO.21.01083.
43. MacDonald HR, Silverstein MJ, Mabry H, Lee LA, Ye W, Holmes DR, et al. Local control in ductal carcinoma in situ treated by excision alone: incremental benefit of larger margins. *Am J Surg*. 2005;190(4):521-5.

44. Dunne C, Burke JP, Morrow M, Kell MR. Effect of margin status on local recurrence after breast conservation and radiation therapy for ductal carcinoma in situ. *J Clin Oncol*. 2009;27(10):1615-20. doi: 10.1200/JCO.2008.17.5182.
45. Morrow M, Van Zee KJ, Solin LJ, Houssami N, Chavez-MacGregor M, Harris JR, et al. Society of Surgical Oncology-American Society for Radiation Oncology-American Society of Clinical Oncology consensus guideline on margins for breast-conserving surgery with whole-breast irradiation in ductal carcinoma in situ. *Pract Radiat Oncol*. 2016;6(5):287-95. doi: 10.1016/j.prro.2016.06.011.
46. Vicini FA, Cecchini RS, White JR, Arthur DW, Julian TB, Rabinovitch RA, et al. Long-term primary results of accelerated partial breast irradiation after breast-conserving surgery for early-stage breast cancer: a randomised, phase 3, equivalence trial. *Lancet*. 2019;394(10215):2155-64. doi: 10.1016/S0140-6736(19)32514-0.
47. Whelan TJ, Julian JA, Berrang TS, Kim DH, Germain I, Nichol AM, et al. External beam accelerated partial breast irradiation versus whole breast irradiation after breast conserving surgery in women with ductal carcinoma in situ and node-negative breast cancer (RAPID): a randomised controlled trial. *Lancet*. 2019;394(10215):2165-72. doi: 10.1016/S0140-6736(19)32515-2.
48. Meattini I, Marrazzo L, Saieva C, Desideri I, Scotti V, Simontacchi G, et al. Accelerated partial-breast irradiation compared with whole-breast irradiation for early breast cancer: long-term results of the randomized phase III APBI-IMRT-Florence trial. *J Clin Oncol*. 2020;38(35):4175-83. doi: 10.1200/JCO.20.00650.
49. Strnad V, Ott OJ, Hildebrandt G, Kauer-Dorner D, Knauerhase H, Major T, et al. 5-year results of accelerated partial breast irradiation using sole interstitial multicatheter brachytherapy versus whole-breast irradiation with boost after breast-conserving surgery for low-risk invasive and in-situ carcinoma of the female breast: a randomised, phase 3, non-inferiority trial. *Lancet*. 2016;387(10015):229-38. doi: 10.1016/S0140-6736(15)00471-7.
50. Moran MS, Zhao Y, Ma S, Kirova Y, Fourquet A, Chen P, et al. Association of radiotherapy boost for ductal carcinoma in situ with local control after whole-breast radiotherapy. *JAMA Oncol*. 2017;3(8):1060-68. doi: 10.1001/jama-oncol.2016.6948.
51. Margolese RG, Cecchini RS, Julian TB, Ganz PA, Costantino JP, Vallow LA, et al. Anastrozole versus tamoxifen in postmenopausal women with ductal carcinoma in situ undergoing lumpectomy plus radiotherapy (NSABP B-35): a randomised, double-blind, phase 3 clinical trial. *Lancet*. 2016;387(10021):849-56. doi: 10.1016/S0140-6736(15)01168-X.
52. Forbes JF, Sestak I, Howell A, Bonanni B, Bundred N, Levy C, et al. Anastrozole versus tamoxifen for the prevention of locoregional and contralateral breast cancer in postmenopausal women with locally excised ductal carcinoma in situ (IBIS-II DCIS): a double-blind, randomised controlled trial. *Lancet*. 2016;387(10021):866-73. doi: 10.1016/S0140-6736(15)01129-0.

TRIDESET GODINA SPECIJALIZACIJE IZ PORODIČNE MEDICINE U POLJSKOJ: STUDIJA SLUČAJA INSTITUCIONALIZACIJE, PRAKSE I PERCEPCIJE PACIJENATA U OKVIRU PRIMARNE ZDRAVSTVENE ZAŠTITE

PREGLEDNI RAD

REVIEW ARTICLE

THIRTY YEARS OF FAMILY MEDICINE SPECIALTY IN POLAND: A CASE STUDY OF ITS INSTITUTIONALIZATION, PRACTICE, AND PATIENT PERCEPTION WITHIN PRIMARY HEALTHCARE

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SAŽETAK

Uvod: Specijalizacija iz porodične medicine (PM) u Poljskoj uvedena je početkom 1990-ih godina kao deo širih reformi zdravstvenog sistema, usmerenih na restrukturiranje primarne zdravstvene zaštite (PZZ) i unapređenje dostupnosti, kontinuiteta i koordinacije nege. Uprkos trodecenijskom razvoju, PM se i dalje suočava sa sistemskim i profesionalnim izazovima unutar poljskog zdravstvenog sistema.

Cilj: Ova studija koristi pristup studije slučaja kako bi istražila evoluciju specijalizacije iz porodične medicine u Poljskoj, sa posebnim fokusom na njene institucionalne temelje, obrazovanje specijalista, ulogu u pružanju PZZ i zadovoljstvo pacijenata pruženim uslugama.

Metode: Korišćen je eksplanatorni tip studije slučaja, uz analizu programskih dokumenata, nastavnih planova i programa, recenzirane naučne literature i nacionalne statistike. Tematska analiza sprovedena je u skladu sa okvirom za evaluaciju studija slučaja u zdravstvenim sistemima.

Rezultati: Specijalizacija iz porodične medicine stekla je punu kliničku i akademsku legitimaciju u Poljskoj. Ipak, samo manjina lekara u PZZ ima formalnu obuku iz PM. Iako program postdiplomske edukacije ispunjava evropske standarde, nedostaju mu longitudinalna evaluacija i ujednačen kvalitet supervizije. Pacijenti generalno iskazuju visoko zadovoljstvo međuljudskim aspektima nege, ali PM ocenjuju niže od drugih specijalističkih grana u oblastima kao što su komunikacija, empatija i emocionalna podrška. Ova specijalizacija se takođe suočava sa poteškoćama u regrutaciji, pri čemu mnoga mesta na specijalizaciji ostaju upražnjena uprkos finansijskim podsticajima.

Zaključak: Specijalizacija iz porodične medicine u Poljskoj ostvarila je značajne strukturne pomake, ali je i dalje nedovoljno iskorišćena i potcenjena unutar sistema PZZ. Dalje reforme treba da se usredsrede na jačanje obrazovnih puteva, poboljšanje uslova rada i promenu javne percepcije. Unapređenje komunikacionih veština i povećanje vidljivosti porodičnih lekara moglo bi doprineti većem zadovoljstvu pacijenata i privlačnosti ove specijalizacije.

Ključne reči: porodična medicina, primarna zdravstvena zaštita, Poljska, medicinsko obrazovanje, zadovoljstvo pacijenata, postdiplomska edukacija, zdravstvene reforme

ABSTRACT

Background: Family medicine (FM) specialty in Poland was introduced in the early 1990s as part of broader health reforms aimed at restructuring primary healthcare (PHC) and improving access, continuity, and coordination of care. Despite three decades of development, FM continues to face systemic and professional challenges within the Polish healthcare system.

Objective: This study used a case study approach to explore the evolution of family medicine specialty in Poland, examining its institutional foundation, specialist training, its role in PHC delivery, and patient satisfaction with services.

Methods: An explanatory case study design was employed, drawing on policy documents, training curricula, peer-reviewed literature, and national statistics. Thematic analysis was guided by a framework for case study evaluation in healthcare systems.

Results: Family medicine specialty has gained full recognition as a clinical and academic specialty in Poland. However, only a minority of PHC physicians are formally trained in FM. While the postgraduate training program aligns with European standards, it lacks longitudinal assessment and consistent quality of supervision. Patients report generally high satisfaction with interpersonal aspects of care but rate family medicine lower than specialist services in areas such as communication, empathy, and emotional support. The specialty also faces recruitment difficulties, with many FM residency slots unfilled despite financial incentives.

Conclusion: Family medicine specialty in Poland has achieved significant structural milestones but remains underutilized and undervalued within the broader PHC system. Reforms should prioritize strengthening its educational pathways, improving working conditions, and addressing public perceptions. Enhancing communication skills and increasing the visibility of family physicians could improve both patient satisfaction and the attractiveness of the specialty.

Keywords: family medicine, primary healthcare, Poland, medical education, patient satisfaction, postgraduate training, healthcare reform

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UVOD

Porodična medicina (PM) je posebna medicinska specijalnost koja pruža sveobuhvatnu i kontinuiranu zdravstvenu zaštitu pojedincima i porodicama, odgovarajući na različite nivoe potreba zdravstvenog sistema. Prema definiciji Svetske organizacije porodičnih lekara (WONCA), porodična medicina je „akademska i naučna disciplina sa sopstvenim obrazovnim sadržajem, istraživanjem, bazom dokaza i kliničkom aktivnošću, te klinička specijalnost usmerena na primarnu zdravstvenu zaštitu (PZZ)“. Odgovara na rastuće potrebe za pružanjem nege prilikom prvog kontakta, upravljanjem hroničnim bolestima, preventivnim uslugama i koordinacijom sve složenijih procesa nege pacijenata [1].

Sa stanovišta klasifikacije zanimanja, Međunarodna standardna klasifikacija zanimanja (ISCO-08) identifikuje lekare opšte prakse, uključujući i porodične lekare, pod šifrom 2211. Ovi stručnjaci „dijagnostikuju, leče i sprečavaju bolesti, povrede i druga fizička i mentalna oštećenja kod ljudi primenom moderne medicine“ i obično rade u okruženjima koja obezbeđuju kontinuitet i sveobuhvatnost nege [2]. Porodični lekari predstavljaju prvi kontakt pacijenata u sistemu zdravstvene zaštite, odgovorni su za ranu dijagnostiku i rešavanje nediferenciranih problema, kontinuitet nege, usmeravanje pacijenata ka drugim nivoima zdravstvene zaštite i pružanje usluga orijentisanih na pojedinca i zajednicu. Direktive Evropske unije, uključujući Direktivu 2005/36/EC i njenu izmenu i dopunu Direktivu 2013/55/EU, definišu standarde i zahteve za medicinsku specijalizaciju u oblasti porodične medicine [3,4]. Ovi zahtevi podrazumevaju najmanje tri godine strukturirane obuke (uključujući iskustvo u bolničkoj i ambulantnoj nezi) i sticanje ključnih kompetencija, kao što su samostalno donošenje kliničkih odluka, komunikacione veštine, interdisciplinarna saradnja i etička medicinska praksa. Evropski ogranak Svetske organizacije porodičnih lekara (WONCA Europe) navodi jedanaest ključnih karakteristika ove discipline, koje su sadržane u šest osnovnih kompetencija: upravljanju primarnom zdravstvenom zaštitom, nezi usmerenoj na pacijenta, specifičnoj veštini rešavanja problema, sveobuhvatnom pristupu, orijentisanosti ka zajednici i holističkom pogledu na pacijenta [1].

Dok je PM široko prihvaćena kao klinička specijalnost u većini evropskih zdravstvenih sistema, njena akademska osnova se razvijala neravnomernije u zemljama Centralne i Istočne Evrope (CEE). Akademska PM ne podrazumeva samo uključivanje ove discipline u nastavne planove i programe, već i njenu institucionalizaciju unutar univerzitetskih struktura, sprovođenje istraživanja i postojanje posvećenih naučnih organizacija [5,6]. Sa metodološkog stanovišta, PM zauzima jedinstvenu poziciju među medicinskim disciplinama. Ona integriše biomed-

INTRODUCTION

Family medicine (FM) is a distinct medical specialty that provides comprehensive and continuous healthcare to individuals and families addressing multiple levels of health system needs. According to the definition developed by the World Organization of Family Doctors (WONCA), family medicine is “an academic and scientific discipline, with its own educational content, research, evidence base and clinical activity, and a clinical specialty oriented to primary care (PHC)”. It responds to growing demands for first-contact care, chronic disease management, preventive services, and coordination of increasingly complex patient pathways [1].

From the perspective of occupational classification, the International Standard Classification of Occupations (ISCO-08) identifies generalist medical practitioners, including family doctors, under code 2211. These professionals “diagnose, treat and prevent illness, disease, injury and other physical and mental impairments in humans through the application of modern medicine” and typically work in settings that ensure continuity and comprehensiveness of care [2]. Family physicians serve as the first point of contact for patients within the healthcare system and are responsible for addressing undifferentiated problems at an early stage, ensuring continuity of care, coordinating referrals, and providing person-centered and community-oriented services. European Union directives such as Directive 2005/36/EC and its amendment Directive 2013/55/EU establish the requirements for medical specialization in FM [3,4]. These include a minimum of three years of structured training (including both hospital and ambulatory care experience), and the acquisition of core competencies such as independent clinical decision-making, communication skills, interdisciplinary collaboration, and ethical medical practice. WONCA Europe outlines eleven key characteristics of the discipline, which are operationalized into six core competencies: primary care management, person-centered care, specific problem-solving skills, a comprehensive approach, community orientation, and a holistic view of the patient [1].

While FM is widely recognized as a clinical specialty in most European health systems, its academic foundation have developed more unevenly across Central and Eastern Europe (CEE). Academic FM refers not only to the inclusion of the discipline in teaching curricula but also to its institutionalization in university structures, the conduct of research, and the presence of dedicated scientific organizations [5,6]. From a methodological standpoint, FM holds a unique position among medical disciplines. It integrates biomedical, behavioral, and social science approaches to understand and manage

cinske, bihevioralne i društveno-naučne pristupe kako bi razumela i upravljala negom pacijenata u kontekstu porodice i zajednice. To podrazumeva svest stanovništva, dugoročnu negu, preventivne intervencije i holistički pristup bolesti [6]. Nakon političkih transformacija 1980-ih i 1990-ih, mnoge postkomunističke zemlje pokrenule su reforme sa ciljem uspostavljanja PM kao praktičnog modela za pružanje PZZ, ali i kao samostalne akademske discipline. U gotovo svim zemljama Centralne i Istočne Evrope katedre za PM formirane su unutar medicinskih fakulteta, dok su nastavni planovi i programi osnovnih i postdiplomskih studija prilagođeni u skladu sa tim [5].

U Poljskoj je PM formalno uvedena početkom 1990-ih, nakon društveno-političke tranzicije koja je usledila nakon pada komunizma. Poreklo porodične medicine u Poljskoj može se pratiti do sastanka održanog 23. juna 1992. godine, kada se trideset četvero lekara okupilo kako bi osnovalo Kolegijum porodičnih lekara u Poljskoj (KLRwP, polj. *Kolegium Lekarzy Rodzinnych w Polsce*), instituciju koja promoviše strategiju integracije porodičnih lekara u sistem javnog zdravlja [7–9]. Poljska PM, modelovana prema sistemima primarne zdravstvene zaštite u Velikoj Britaniji i Holandiji, postepeno je zamenila prethodni poliklinički model. Pre tog procesa, pristup zdravstvenoj zaštiti često je bio neujednačen, dominirali su gradski klinički centri, a prisutne su bile i koruptivne prakse koje su stavljale pacijente iz provincije u nepovoljan položaj [9]. Tokom 1990-ih, KLRwP je uložio napore da se PM razvije kao priznata medicinska specijalnost. Do 1996. godine, nakon jednogodišnje evaluacije, KLRwP je stekao punopravno članstvo u Svetskoj organizaciji porodičnih lekara. Dalji napredak postignut je 1999. godine osnivanjem Poljskog društva za porodičnu medicinu (PTMR, polj. *Polskie Towarzystwo Medycyny Rodzinnej*) [10]. PTMR je od tada rukovodio razvojem nastavnih planova i programa, postdiplomskog obrazovanja, recenziranih publikacija, uključujući časopis *Lekarz POZ* (eng. *PHC Doctor*) [11], i afirmisanjem profesionalnog identiteta unutar discipline porodične medicine. Do svoje 25. godišnjice, 2017. godine, ova specijalnost je od kreatora politika sve više prepoznata kao isplativa i nezamenljiva komponenta primarne zdravstvene zaštite. Ovo je takođe označilo strukturnu transformaciju od prethodno fragmentiranog i urbano-centričnog modela ka savremenijem, pristupačnijem i na zajednicu usmerenog sistema, fokusiranog na praksu porodičnih lekara po uzoru na zapadnoevropske modele [9]. U 2022. godini, kada je disciplina proslavila svoju 30. godišnjicu, u izveštaju je zaključeno da je porodična medicina i dalje najpouzdaniji i najpozitivnije ocenjen sektor u poljskom zdravstvenom sistemu [8]. Tokom tri decenije, PM je konsolidovala svoj status priznate specijalističke i akademske oblasti, oblikuju-

patient care in the context of families and communities. This includes population-level awareness, long-term care, preventive interventions, and a holistic perspective on illness [6]. Following the political transformations of the 1980s/1990s, many post-communist countries initiated reforms that sought to establish FM both as a practical model for PHC delivery and as a distinct academic discipline. In almost all CEE countries, departments of FM were created within medical faculties, and undergraduate and postgraduate curricula were updated accordingly [5].

In Poland, FM was formally introduced in the early 1990s, following the socio-political transition after the fall of communism. The origins of FM in Poland can be traced to a meeting on 23rd June 1992, when thirty-four physicians convened to establish The College of Family Physicians in Poland (KLRwP, pol. *Kolegium Lekarzy Rodzinnych w Polsce*) as a strategy-promoting institution for the integration of family doctors into the public health system [7–9]. Polish FM, modeled on PHC systems in the UK and the Netherlands, gradually replaced the former polyclinic model. Prior to this process, access to care was often inequitable, dominated by urban clinical centres and burdened by corrupt practices that disadvantaged provincial patients [9]. Throughout the 1990s, the KLRwP galvanized efforts to develop FM as a recognized medical specialty. By 1996, after a year-long evaluation, the KLRwP achieved full membership in the WONCA. In 1999, further advancement was achieved through the creation of the Polish Society of FM (PTMR, pol. *Polskie Towarzystwo Medycyny Rodzinnej*) [10]. The PTMR has since led development of training curricula, postgraduate education, peer-reviewed publications such as the *Lekarz POZ* (eng. *PHC Doctor*) journal [11], and fostering professional identity within the discipline. By its 25th anniversary in 2017, the specialty had gained increasing recognition from policymakers as both cost-effective and indispensable within the framework of primary healthcare. This also marked the structural transformation from a previously fragmented and urban-centric model to a more modern, accessible, and community-oriented system, centered around family physicians' practices modelled after Western European systems [9]. In 2022, as the discipline celebrated its 30th anniversary, the report concluded that FM remained the most trusted and positively rated sector within Polish healthcare [8]. Over three decades, FM has matured into a recognized specialty and academic field, shaping PHC and influencing health policy at the national level.

The study aimed to describe FM specialty in Poland using a case study approach and identify its strengths and challenges in the national context.

ći primarnu zdravstvenu zaštitu i značajno utičući na zdravstvenu politiku na nacionalnom nivou.

Ova studija je imala za cilj da opiše specijalizaciju iz PM u Poljskoj koristeći pristup studije slučaja i da identifikuje njene dobre strane i izazove u nacionalnom kontekstu.

METOD

Studija je sprovedena primenom eksplanatornog tipa studije slučaja, kako su ga opisali Krou i saradnici, sa ciljem istraživanja razvoja, implementacije i načina na koji trenutno funkcioniše PM u okviru sistema PZZ u Poljskoj [12]. Studija slučaja je odabrana zbog svoje prikladnosti za analizu složenih fenomena u stvarnom okruženju, unutar njihovih specifičnih političkih i institucionalnih konteksta. Ova studija se zasnivala isključivo na sekundarnim izvorima podataka (programskim dokumentima, nastavnim planovima i programima, statističkim izveštajima i recenziranoj literaturi). Shodno tome, dobijene rezultate treba razumeti prvenstveno kao interpretativne i deskriptivne, a ne kao empirijski merljive.

Izbor slučaja i ograničenja

Jedinica analize bio je nacionalni sistem PZZ-a u Poljskoj, sa posebnim osvrtom na ulogu i institucionalizaciju PM od njenog formalnog priznanja kao medicinske specijalnosti. Vremenski okvir obuhvata period od ranih 1990-ih, kada je PM uvedena, do najnovijih političkih dešavanja iz 2024. godine.

Izvori podataka

Podaci su prikupljeni iz različitih javno dostupnih izvora, uključujući: recenziranu literaturu o PM i PZZ u Poljskoj i Evropi; nacionalno zakonodavstvo i programska dokumenta koja su izdali Ministarstvo zdravlja i Nacionalni zdravstveni fond; nastavne planove i programe, kao i propise postdiplomske obuke; statističke izveštaje strukovnih organizacija i vladinih baza podataka; sivu literaturu, uključujući argumentativne radove i stručne komentare poljskih medicinskih udruženja. Primarno prikupljanje podataka nije sprovedeno.

Analiza podataka

Podaci su sintetizovani korišćenjem kvazikvalitativne narativne sinteze, u skladu sa metodološkim okvirom koji su predložili Krou i saradnici [12]. Ovaj pristup je stavio akcenat na interpretativnu identifikaciju kontekstualnih faktora, strukturu sistema i politiku koja oblikuje PM unutar poljskog sistema PZZ-a. S obzirom na to da se studija oslanjala isključivo na sekundarne izvore, formalni postupak kodiranja nije primenjen. Ključne teme razvijane su iterativno i interpretirane u kontekstu postojećih međunarodnih modela i preporuka za PM.

METHODS

This study was conducted using an explanatory case study design, as described by Crowe et al. to investigate the development, implementation, and current functioning of FM within the PHC system in Poland [12]. The case study approach was chosen due to its suitability for exploring complex, real-world phenomena within their specific policy and institutional contexts. This study relied exclusively on secondary data sources (policy documents, training curricula, statistical reports, and peer-reviewed literature). As such, findings should be understood as interpretive and descriptive rather than empirically measured.

Case Selection and Boundaries

The unit of analysis was the national PHC system in Poland, with particular emphasis on the role and institutionalization of FM since its formal recognition as a medical specialty. The temporal scope covered the period from the introduction of FM in the early 1990s to the most recent policy developments as of 2024.

Data Sources

Data were collected from a variety of publicly available sources including: peer-reviewed literature on FM and PHC in Poland and Europe; national legislation and policy documents issued by the Ministry of Health and National Health Fund; postgraduate training program curricula and regulations; statistical reports from professional organizations and governmental databases; grey literature, including position papers and expert commentary from Polish medical associations. No primary data collection was conducted.

Data Analysis

The data were synthesized using quasi-qualitative narrative synthesis, guided by the framework proposed by Crowe et al. [12]. This approach emphasized the interpretive identification of contextual factors, system structure, and policy shaping the FM within Polish PHC. As the study relied exclusively on secondary sources, no formal coding procedure was applied. Key themes were iteratively developed and interpreted in relation to existing international models and recommendations for FM.

RESULTS

Family Medicine and Primary Healthcare in Poland

In Poland, FM plays a central role in the structure of PHC, which forms the foundation of the national health sys-

REZULTATI

Porodična medicina i primarna zdravstvena zaštita u Poljskoj

U Poljskoj, porodična medicina igra centralnu ulogu u strukturi primarne zdravstvene zaštite, koja predstavlja temelj nacionalnog zdravstvenog sistema. Usluge primarne zdravstvene zaštite pružaju se kroz široku mrežu ambulanti i pretežno se finansiraju putem predugovora sa Nacionalnim zdravstvenim fondom (NFZ; polj. *Narodowy Fundusz Zdrowia*) po principu plaćanja po pacijentu. Porodični lekari, zajedno sa specijalistima interne medicine i pedijatrije, ovlašćeni su za pružanje sveobuhvatnih usluga PZZ-a. Pravo na punu praksu kao pružalac usluga PZZ-a podrazumeva posedovanje specijalizacije iz PM ili upis na obuku iz PM. Pored toga, internisti i pedijatri mogu se kvalifikovati nakon završetka obaveznog kursa obuke specifičnog za PM. Međutim, samo priznatim lekarima dozvoljeno je da prikupljaju izjave pacijenata, što je ključni mehanizam za obezbeđivanje finansiranja u okviru predugovornog modela koji podrazumeva plaćanje po pacijentu, što ima značajne finansijske i organizacione posledice za prakse primarne zdravstvene zaštite. Od 2023. godine, tek oko 9.000 od ukupno 36.000 lekara zaposlenih u primarnoj zdravstvenoj zaštiti imalo je specijalizaciju iz porodične medicine i aktivno je pružalo usluge u ambulantama javnog zdravstvenog sistema [13]. Većinu pružalaca usluga primarne zdravstvene zaštite i dalje čine internisti i pedijatri. U tom kontekstu, iako je PM konceptualno u potpunosti usklađena sa ciljevima primarne zdravstvene zaštite, ona još uvek nije u potpunosti uspostavljena kao primarni profesionalni identitet unutar sistema [14].

Postdiplomska obuka iz porodične medicine u Poljskoj

Postdiplomski program obuke iz PM u Poljskoj je strukturisan program zasnovan na kompetencijama, osmišljen da pripremi lekare za samostalnu praksu u sistemu primarne zdravstvene zaštite [15]. Program reguliše Ministarstvo zdravlja i u skladu je sa nacionalnim zakonodavstvom o specijalističkoj obuci (Uredba ministra zdravlja od 4. maja 2023. o specijalizaciji lekara i stomatologa, *Journal of Laws* 2023, tačka 975). Standardno trajanje programa je četiri godine (48 meseci) i obuhvata kliničke rotacije, praksu pod nadzorom, teorijsku nastavu i obavezne kurseve sertifikacije. Program počinje jednonedeljnim uvodnim modulom koji pokriva osnove PM, strukturu poljskog zdravstvenog sistema i zakonske propise relevantne za medicinsku praksu. Nakon toga, specijalizanti prolaze kroz niz kliničkih rotacija u ključnim specijalnostima koje su sadržane u oblasti porodične medicine. Rotacije obuhvataju internu me-

tem. PHC services are delivered through a broad network of outpatient clinics and are primarily financed through capitation-based contracts with the National Health Fund (NFZ; pol. *Narodowy Fundusz Zdrowia*). Family physicians, alongside specialists in internal medicine and pediatrics, are authorized to provide comprehensive PHC services. Eligibility for full practice as a PHC provider includes holding a specialization in FM or being enrolled in FM training. In addition, internists and pediatricians may qualify if they complete a mandatory FM-specific training course. However, only physicians with recognized eligibility are permitted to collect patient declarations - a key mechanism for securing funding under the capitation model, leading to financial and organizational consequences for PHC practices. As of 2023, only approximately 9,000 out of 36,000 physicians working in PHC held a specialization in family medicine and actively practiced in public outpatient settings [13]. The majority of PHC providers continue to be internists and pediatricians. In this context, while FM is conceptually aligned with the goals of PHC, it is not yet fully established as the primary professional identity within the system [14].

Postgraduate Training in Family Medicine in Poland

The postgraduate training program in FM in Poland is a structured, competency-based residency designed to prepare physicians for independent practice within the primary healthcare system [15]. It is regulated by the Ministry of Health and aligned with national legislation on specialist training (Regulation of the Minister of Health of 4th May 2023 on the specialization of physicians and dentists, *Journal of Laws* 2023, item 975). The standard duration of the program is four years (48 months), combining clinical rotations, supervised practice, theoretical instruction, and mandatory certification courses. The program begins with a one-month introductory module covering the fundamentals of FM, the structure of the Polish healthcare system, and legal regulations relevant to medical practice. Following this, residents complete a series of clinical rotations across key specialties that reflect the scope of family practice. These include internal medicine (6 months), pediatrics (4 months), obstetrics and gynecology (2 months), psychiatry (2 months), dermatology (1 month), otolaryngology and ophthalmology (1 month, combined), emergency medicine (3 months), and a 2-month combined rotation in geriatrics, rehabilitation, and palliative care. A central component of the training consists of at least 18 months of supervised practice in accredited FM clinic. During this period, residents gain experience in delivering continuous,

dicinu (6 meseci), pedijatriju (4 meseca), ginekologiju i akušerstvo (2 meseca), psihijatriju (2 meseca), dermatologiju (1 mesec), otorinolaringologiju i oftalmologiju (1 mesec, kombinovano), urgentnu medicinu (3 meseca) i dvomesečnu kombinovanu rotaciju iz gerijatrije, rehabilitacije i palijativne nege. Centralna komponenta obuke obuhvata najmanje 18 meseci prakse pod nadzorom u akreditovanoj klinici. Tokom ovog perioda, specijalizanti stiču iskustvo u pružanju kontinuirane, na pacijenta usmerene nege, uključujući sve starosne grupe i različita zdravstvena stanja. Obuka naglašava prevenciju, ranu dijagnostiku, lečenje hroničnih bolesti, unapređenje zdravlja i koordinaciju pružanja nege unutar zdravstvenog sistema. Program obuhvata najmanje 320 sati teorijske nastave, koja pokriva teme kao što su komunikacijske veštine, kliničko rasuđivanje, javno zdravlje, etika i praksa zasnovana na dokazima. Polaznici su takođe obavezni da završe sertifikovane kurseve životne podrške, uključujući osnovnu životnu podršku (BLS) i naprednu životnu podršku (ALS). Program se završava nacionalnim specijalističkim ispitom (PES, polj. *Państwowy Egzamin Specjalizacyjny*), kojim se procenjuju medicinsko znanje, kliničko rasuđivanje i spremnost za samostalnu praksu kao lekara porodične medicine. Iako se poljski program specijalizacije eksplicitno ne poziva na međunarodne okvire, kao što su oni koje je razvio evropski ogranak Svetske organizacije porodičnih lekara (WONCA Europe), on je usko usklađen sa Direktivom Evropske unije 2005/36/EC (izmenjenom i dopunjenom Direktivom 2013/55/EU), koja definiše formalne zahteve za postdiplomsku obuku u opštoj medicinskoj praksi. U praktičnom smislu, poljski nastavni plan i program pokrivaju oblasti definisane kroz šest osnovnih kompetencija prema Svetskoj organizaciji porodičnih lekara. Ipak, u poređenju sa postdiplomskim sistemima obuke u medicini u drugim evropskim zemljama, jasno se uočavaju određena područja u kojima poljski program može biti unapređen [16]. Primećuje se da obuci, koja formalno jeste zasnovana na kompetencijama, nedostaje strukturisan sistem longitudinalne procene koji kontinuirano prati napredak specijalizanata tokom celog programa. Za razliku od zemalja poput Ujedinjenog Kraljevstva i Holandije, gde polaznici prolaze kroz stalnu evaluaciju putem procena na radnom mestu, strukturisanih povratnih informacija i korišćenja elektronskih portfolija, poljski sistem se pretežno oslanja na nacionalni specijalistički ispit (PES) [15]. Takođe, upotreba validiranih instrumenata za procenu kliničkih veština, komunikacije i profesionalnog ponašanja je ograničena. Pored toga, učestvovanje u programima za razvoj trenera nije obavezno, što može doprineti varijabilnosti u kvalitetu supervizije i povratnih informacija tokom čitavog perioda obuke [16].

patient-centered care across all age groups and conditions. The training emphasizes prevention, early diagnosis, management of chronic diseases, health promotion, and coordination of care within the health system. The program includes a minimum of 320 hours of theoretical instruction, covering topics such as communication skills, clinical reasoning, public health, ethics, and evidence-based practice. Trainees are also required to complete certified life support courses, including Basic Life Support (BLS) and Advanced Life Support (ALS). The program ends with a national specialization examination (PES, pol. *Państwowy Egzamin Specjalizacyjny*), which assesses medical knowledge, clinical judgment, and readiness for autonomous practice as a family physician. Although the Polish specialization program does not explicitly refer to international frameworks such as those developed by WONCA Europe, it aligns closely with the European Union's Directive 2005/36/EC (as amended by Directive 2013/55/EU), which outlines formal requirements for postgraduate training in general medical practice. In practical terms, the Polish curriculum covers the domains specified in WONCA's six core competencies. However, when compared to postgraduate FM training systems in other European countries, certain areas for improvement in the Polish program become apparent [16]. Notably, while the training is formally competency-based, it lacks a structured system of longitudinal assessment that monitors the resident's progress throughout the entire program. Unlike in countries such as the United Kingdom and the Netherlands, where trainees undergo continuous evaluation through workplace-based assessments, structured feedback, and the use of electronic portfolios, the Polish system relies primarily on a PES [15]. There is also limited use of validated tools to assess clinical skills, communication, and professional behavior. Furthermore, participation in trainer development programs is not mandatory, which may contribute to variability in the quality of supervision and feedback during training [16].

Challenges Facing Family Medicine in the Polish Primary Healthcare System

Despite more than three decades of family medicine serving as a cornerstone of primary healthcare in Poland, the discipline continues to face workforce, PR, and policy-related challenges [14]. One of the most pressing concerns is the chronic shortage and unequal distribution of primary care physicians. While Poland's public spending on primary healthcare is among the highest in the Organization for Economic Cooperation and Development (OECD) (17% compared to the OECD25 average of 13%), the country

Izazovi sa kojima se suočava porodična medicina u poljskom sistemu primarne zdravstvene zaštite

Uprkos tome što porodična medicina više od tri decenije predstavlja temelj primarne zdravstvene zaštite u Poljskoj, ova disciplina i dalje se suočava sa izazovima vezanim za radnu snagu, odnose sa javnošću i zdravstvenu politiku [14]. Jedan od najozbiljnijih problema predstavlja hronični nedostatak i neujednačena raspodela lekara u primarnoj zdravstvenoj zaštiti. Iako je javna potrošnja Poljske na primarnu zdravstvenu zaštitu među najvišim u Organizaciji za ekonomsku saradnju i razvoj (OECD) – 17% u poređenju sa prosekom OECD25 od 13% – zemlja i dalje zaostaje po broju lekara po stanovniku, sa samo 3,4 lekara na 1.000 stanovnika. Posebno zabrinjava izuzetno nizak udeo lekara opšte prakse, koji čine svega 8% ukupnog broja lekara u Poljskoj, u poređenju sa prosekom OECD33 od 23% [17].

Privlačnost porodične medicine kao specijalnosti značajno varira od zemlje do zemlje i oblikovana je sistemskim, obrazovnim i ličnim faktorima. Međunarodne studije ukazuju na to da se lični razlozi vezani za stil života, uključujući ravnotežu između profesionalnog i privatnog života, manji broj noćnih i vikend smena, kao i mogućnost provođenja više vremena sa porodicom, nalaze među najuticajnijim faktorima pri izboru porodične medicine [14,18–21]. Razlozi koje odvrćaju mlade lekare od izbora porodične medicine uključuju nedostatak prestiža, visoko administrativno opterećenje, zahteve pacijenata za nepotrebnim izveštajima ili receptima i ograničene mogućnosti za superspecijalizaciju. Pored toga, prisustvo pozitivnih uzora i integracija porodične medicine u nastavni plan i program osnovnih studija smatraju se odlučujućim faktorima u oblikovanju stavova prema ovoj disciplini [18,19,20]. U Poljskoj se primećuje slična dinamika. Multicentrična studija preseka, koja je obuhvatila više od 2.000 studenata medicine sa pet univerziteta, pokazala je da interesovanje za porodičnu medicinu raste tokom studija (17% u prvoj godini, 30% u šestoj) što ukazuje na pozitivan uticaj kliničkog iskustva [20]. Najuticajniji faktor pri izboru porodične medicine bila je mogućnost profesionalnog razvoja, zatim intelektualni izazov i povoljna ravnoteža između posla i privatnog života. Međutim, studenti koji su odbili PM naveli su ograničene mogućnosti rada u bolničkom okruženju, percipiran birokratski pritisak i nedostatak fleksibilnosti pri promeni specijalnosti. Ovi rezultati ukazuju na to da bi, kako bi se povećala privlačnost PM u Poljskoj, reforme trebalo da se usmere na veće uključivanje PM u diplomatske programe, unapređenje vidljivosti i percipiranog statusa discipline, kao i na pružanje strukturisanih podsticaja tokom postdiplomskih studija.

still lags in physician density, with only 3.4 doctors per 1,000 population. Of particular concern is the extremely low proportion of general practitioners – only 8% of all doctors in Poland, as compared to the OECD33 average of 23% [17].

The attractiveness of FM as a specialty varies significantly across countries, shaped by systemic, educational, and personal factors. International studies emphasize that personal lifestyle considerations, such as work-life balance, fewer night and weekend shifts, and the ability to spend more time with family are among the most influential reasons for choosing FM [14,18–21]. Concerns that deter young doctors from choosing FM include a lack of prestige, high administrative burden, patient demands for unnecessary reports or prescriptions, and insufficient opportunities for subspecialization. Moreover, the presence of positive role models and the integration of FM into the undergraduate curriculum are reported to be decisive in shaping attitudes toward the discipline [18,19,20]. In Poland, similar dynamics are observed. A multicenter cross-sectional study involving over 2,000 medical students from five universities found that interest in FM increases during the course of medical education – from 17% in the first year to 30% in the sixth, indicating the positive impact of clinical exposure [20]. The most influential factor for choosing FM was the opportunity for professional development, followed by intellectual challenge and a favorable work-life balance. However, students who rejected FM cited limited opportunities to work in hospital settings, perceived bureaucratic burdens, and a lack of flexibility in switching specialties. These findings suggest that to enhance the appeal of FM in Poland, reforms should focus on increasing its presence in undergraduate curricula, improving the visibility and perceived status of FM, and offering structural incentives during postgraduate training.

Although admissions to medical programs have reached record highs – over 10,000 students in the 2024/2025 academic year, many FM residency positions remain unfilled. A key reason might be the persistently low prestige of FM among students, often reinforced by negative perceptions during training. Extra financial incentives were introduced in 2023, including higher base salaries for priority specialties such as FM. These measures represent a step forward, yet they have not led to significant improvements in recruitment. Given the long pathway from medical school to independent practice, such measures alone are unlikely to yield prompt results. Crucially, efforts to enhance the attractiveness of FM are hindered by a lack of systematic data on medical career preferences and the real-world impact of incentive programs [14].

Iako je broj upisa na medicinske programe dostigao rekordno visoke vrednosti – preko 10.000 studenata u akademskoj 2024/2025. godini – mnoga mesta za specijalizaciju iz porodične medicine i dalje su nepopunjena. Primarni razlog za ovu pojavu može biti kontinuirano nizak ugled PM među studentima, koji je često dodatno pojačan negativnim percepcijama sticanim tokom studija. Dodatni finansijski podsticaji uvedeni su 2023. godine, uključujući povećanje osnovnih plata za prioritetne specijalnosti, među kojima je i porodična medicina. Ove mere predstavljaju značajan korak napred, ali nisu dovele do primetnog poboljšanja u regrutovanju. S obzirom na dug put od medicinskog fakulteta do samostalne prakse, malo je verovatno da će ovakve mere same po sebi doneti brze rezultate. Ključni izazov u naporima za povećanje privlačnosti PM predstavlja nedostatak sistematskih podataka o preferencijama u vezi sa medicinskom karijerom i o uticaju programa podsticaja na stvarni život [14].

Zadovoljstvo pacijenata uslugama primarne zdravstvene zaštite

U poljskom zdravstvenom sistemu, porodični lekari predstavljaju ključnu komponentu primarne zdravstvene zaštite, gde rade zajedno sa internistima i pedijatrijama kako bi pružili sveobuhvatnu negu pacijentima tokom prvog kontakta. Međutim, trenutne organizacione strukture i sistemi izveštavanja ne prave razliku između ovih grupa pružalaca usluga u pogledu pružanja nege ili evaluacije njihovog rada. Kao rezultat toga, većina dostupnih podataka o zadovoljstvu pacijenata odnosi se pretežno na primarnu zdravstvenu zaštitu u celini, bez izdvajanja iskustava specifičnih za porodičnu medicinu. Ovo strukturno ograničenje otežava procenu posebnog doprinosa lekara porodične medicine stepenu zadovoljstva pacijenata. Stoga se ovaj odeljak fokusira na opšte zadovoljstvo pacijenata u okviru primarne zdravstvene zaštite, uz napomenu da rezultati odražavaju zajednički učinak svih relevantnih pružalaca usluga, uključujući i one obučene za porodičnu medicinu.

Prema studiji „Kvalitet i troškovi primarne zdravstvene zaštite u Evropi“ (QUALICOPC), poljski pacijenti generalno prijavljuju pozitivna iskustva sa uslugama primarne zdravstvene zaštite, posebno u oblastima kvaliteta nege i komunikacije između pacijenta i lekara [22]. Najveći stepen zadovoljstva kod pacijenata bio je povezan sa međuljudskim aspektima nege – pacijenti su cenili jasna objašnjenja, spremnost lekara da ih pažljivo sasluša i sposobnost lekara da iskaže empatiju. Primetno je da je indeks ispunjenih očekivanja kada je kvalitet nege u pitanju bio najviši među ocenjenim domenima, a potom su sledili ravnopravnost, kontinuitet i pristupačnost. Iako su pacijenti pristupačnost rangirali

Satisfaction of patients with primary healthcare services

In the Polish healthcare system, family physicians are a core component of PHC, working alongside internists and pediatricians to provide comprehensive first-contact care. However, the current organizational and reporting structures do not distinguish between these provider groups in service delivery or evaluation. As a result, most available data on patient satisfaction refer broadly to PHC services as a whole, without isolating experiences specific to FM. This structural limitation makes it difficult to assess the distinct contribution of family physicians to patient satisfaction. Therefore, this section focuses on general patient satisfaction within PHC, recognizing that the findings reflect the shared performance of all eligible providers, including those trained in family medicine.

According to the Quality and Costs of Primary Care in Europe (QUALICOPC) study, Polish patients generally report positive experiences with PHC services, especially in the domains of quality of care and patient-doctor communication [22]. The highest satisfaction was associated with interpersonal aspects of care - patients valued clear explanations, attentive listening, and the physician's ability to show empathy. Notably, the met expectation index (MEI) for quality of care was the highest among evaluated domains, followed by equity, continuity, and accessibility. Despite accessibility being ranked as the most important attribute by patients, it also showed the greatest potential for improvement, highlighting systemic shortcomings in timely and convenient access to services. The study revealed a mismatch between patient preferences and experiences in areas such as involvement in decision-making and the opportunity to discuss psychosocial concerns during consultations. Overall, the findings emphasize the importance of continued investment in communication skills training and patient-centered approaches for PHC physicians. Polish patients' satisfaction with family doctors seems to be primarily shaped by the quality of interpersonal interactions, rather than technical competencies or contextual factors alone [23]. Expressions of dissatisfaction were more often linked to contextual aspects of care, such as waiting times or access barriers, whereas positive feedback focused on physicians' personal qualities and communication style. These patterns are substantiated by another analysis from the Polish arm of the QUALICOPC project, which explored both patient and physician perspectives on PHC services [24]. Consistent with later findings [22], the study confirmed that patients reported the highest satisfaction in domains related to interpersonal aspects of

kao najvažniji atribut, upravo je ona pokazala najveći potencijal za unapređenje, ukazujući na sistemske nedostatke u blagovremenom i praktičnom pristupu usluga. Studija je takođe otkrila nesklad između preferencija pacijenata i njihovih iskustava u oblastima kao što su učestvovanje u donošenju odluka i mogućnost razgovora o psihosocijalnim pitanjima tokom pregleda. Generalno, ovi rezultati naglašavaju značaj kontinuiranog ulaganja u obuku lekara PZZ-a iz oblasti komunikacijskih veština i primene pristupa usmerenog na pacijenta. Čini se da je zadovoljstvo poljskih pacijenata radom porodičnih lekara pretežno uslovljeno kvalitetom međuljudskih interakcija, a ne isključivo tehničkim kompetencijama ili kontekstualnim faktorima [23]. Nezadovoljstvo je češće izražavano u vezi sa kontekstualnim aspektima nege, kao što su vreme čekanja ili prepreke u pristupu sistemu, dok su se pozitivne povratne informacije odnosile na lične kvalitete lekara i njihov stil komunikacije. Ove obrasce potvrđuje i dodatna analiza poljskog ogranka projekta QUALICOPC, koja je istraživala perspektive kako pacijenata tako i lekara u vezi sa pružanjem usluga iz oblasti PZZ-a [24]. U skladu sa kasnijim nalazima [22], studija je potvrdila da su pacijenti prijavili najveći stepen zadovoljstva u oblastima koje se odnose na međuljudske aspekte nege, naročito kvalitet i ravnopravnost, dok je istovremeno istaknuto da je potrebno unaprediti pristupačnost. Važno je napomenuti da je studija takođe pokazala da duže trajanje pregleda, ruralna lokacija i veće iskustvo lekara pozitivno koreliraju sa stepenom zadovoljstva pacijenta, čime se dodatno naglašava značaj ulaganja vremena i kontinuiranog oblikovanja iskustava pacijenata. Iako su pacijenti pozitivno ocenili osnovne aspekte pružanja nege, lekari su iskazali kritičnije stavove, posebno u pogledu koordinacije i sveobuhvatnosti nege, što ukazuje na sistemski jaz između zadovoljstva koje prijavljuju pacijenti i učinaka koji percipiraju pružaoci usluga.

I druge studije su na sličan način istakle centralnu ulogu koju međuljudski faktori, poput empatije, aktivnog slušanja i jasne komunikacije, imaju u oblikovanju zadovoljstva pacijenata na svim nivoima nege [25,26]. Iako poljski pacijenti generalno prijavljuju zadovoljavajuća iskustva sa uslugama primarne zdravstvene zaštite, i dalje postoje značajne razlike u poređenju sa specijalističkom ambulantnom negom [25]. Kao što je pokazala nedavna velika onlajn studija preseka, pacijenti su manje povoljno ocenili konsultacije sa lekarima primarne zdravstvene zaštite u oblastima koje se odnose na emocionalnu podršku, jasnoću komunikacije i angažovanost lekara. Percepcija lekara opšte prakse podrazumeva pružanje manje detaljnih objašnjenja, ograničenu brigu za širu dobrobit pacijenata i manje mogućnosti za razgovor o psihološkim pitanjima ili problemima ve-

care, particularly quality and equity, while highlighting accessibility as an area needing improvement. Importantly, the study also identified that longer consultation times, rural practice settings, and greater physician experience were positively associated with patient satisfaction, reinforcing the significance of time investment and relational continuity in shaping patients' experiences. Although patients rated core elements of care delivery positively, physicians expressed more critical views, especially regarding care coordination and comprehensiveness, suggesting a systemic disconnect between patient-reported satisfaction and provider-perceived performance.

Other studies have similarly emphasized the central role of interpersonal factors, such as empathy, active listening, and clear communication in shaping patient satisfaction across levels of care [25,26]. While Polish patients generally report satisfactory experiences with PHC services, notable differences remain when compared to specialist ambulatory care [25]. As demonstrated in a recent large-scale web-based cross-sectional study, patients rated PHC consultations less favorably in domains related to emotional support, clarity of communication, and physician engagement. FM doctors were often perceived as providing less detailed explanations, showing limited concern for patients' broader well-being, and offering fewer opportunities to discuss psychological or coping-related concerns [25]. Findings from local studies conducted in small Polish communities also reinforce the role of interpersonal factors in shaping patient satisfaction within PHC [26]. In a comparative analysis of patient experiences in public and private PHC centers in the Lubelskie Voivodeship, trust in the physician, the accuracy of diagnosis, and the quality of patient-staff interactions were strongly associated with continued use of services. Older patients, in particular, emphasized the importance of kindness, compassion, and attentiveness, not only from doctors but also from nurses, highlighting the relational nature of satisfactory care. The study further confirmed that negative perceptions were often linked to poor communication, lack of information about treatment progress, or feelings of being disregarded by medical personnel. Importantly, differences in patient satisfaction were not primarily attributed to the public or private nature of the healthcare provider, but rather to perceived accessibility, infrastructure quality, and interpersonal relationships. This aligns with previous research indicating that satisfaction is driven less by the technical or administrative structure of care and more by the patient's personal experience during the consultation [22,24].

zanim za suočavanje sa stresom [25]. Rezultati lokalnih studija sprovedenih u manjim poljskim zajednicama takođe potvrđuju značaj međuljudskih faktora u oblikovanju zadovoljstva pacijenata u PZZ [26]. U komparativnoj analizi iskustava pacijenata u javnim i privatnim centrima primarne zdravstvene zaštite u vojvodstvu Lublin, poverenje u lekara, tačnost dijagnoze i kvalitet interakcije između pacijenta i osoblja bili su snažno povezani sa kontinuiranim korišćenjem usluga. Stariji pacijenti su posebno isticali značaj ljubaznosti, saosećanja i pažnje, ne samo od strane lekara, već i od strane medicinskih sestara, naglašavajući relacijsku prirodu zadovoljavajuće nege. Studija je dodatno potvrdila da su negativne percepcije često povezane sa slabom komunikacijom, nedostatkom informacija o napretku u lečenju ili osećajem zanemarivanja od strane medicinskog osoblja. Važno je naglasiti da razlike u zadovoljstvu pacijenata nisu primarno povezane sa javnim ili privatnim karakterom pružaoca zdravstvenih usluga, već sa percipiranom dostupnošću, kvalitetom infrastrukture i međuljudskim odnosima. Ovo se poklapa sa prethodnim istraživanjima koja ukazuju na to da zadovoljstvo pacijenata manje zavisi od tehničke ili administrativne strukture nege, a više od ličnog iskustva tokom pregleda [22,24].

ZAKLJUČAK

PM funkcioniše kao priznata specijalnost u poljskom zdravstvenom sistemu od ranih 1990-ih, doprinosi transformaciji primarne zdravstvene zaštite sa fragmentiranog i bolnički orijentisanog modela ka pristupačnijoj strukturi orijentisanoj ka zajednici. Uprkos ovim postignućima, broj lekara porodične medicine ostaje nesrazmerno nizak unutar sistema primarne zdravstvene zaštite. Studija slučaja je identifikovala nekoliko prednosti trenutnog modela porodične nege u Poljskoj, uključujući njegovu formalnu institucionalizaciju, usklađenost sa evropskim standardima obuke i visok nivo poverenja pacijenata povezan sa međuljudskim aspektima nege. Međutim, trajni izazovi uključuju nedostatak radne snage, ograničenu privlačnost specijalnosti među diplomcima medicine i nedoslednosti u kvalitetu postdiplomske obuke. Da bi se osigurala dugoročna održivost i efikasnost porodične nege u Poljskoj, neophodne su ciljano usmerene reforme. Pod time se podrazumeva unapređenje kvaliteta i vidljivosti obuke iz PM, potpunija integracija porodične medicine u dodiplomsko obrazovanje, promocija njenog profesionalnog identiteta i uklanjanje prepreka za zapošljavanje i zadržavanje kadrova. Ključno je da napore za jačanje porodične medicine ne budu vođeni isključivo programskom politikom, već i zasnovani na iskustvima kako pružalaca usluga, tako i pacijenata unutar sistema PZZ-a.

CONCLUSION

FM has operated as a recognized specialty in the Polish healthcare system since the early 1990s, contributing to the transformation of PHC from a fragmented and hospital-centric model to a more accessible, community-oriented structure. Despite these achievements, the number of family physicians remains disproportionately low within the PHC system. The case study identified several strengths of the current FM model in Poland, including its formal institutionalization, alignment with European training standards, and the high level of patient trust associated with interpersonal aspects of care. However, persistent challenges include workforce shortages, the limited attractiveness of the specialty among medical graduates, inconsistencies in postgraduate training quality. To ensure the long-term sustainability and effectiveness of FM in Poland, targeted reforms are needed. These include improving the quality and visibility of FM training, integrating family medicine more fully into undergraduate education, promoting its professional identity, and addressing barriers to recruitment and retention. Importantly, efforts to strengthen family medicine should not only be policy-driven but also informed by the lived experiences of both providers and patients within the PHC system.

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LITERATURA / REFERENCES

- Allen J, Gay B, Crebolder H, Heyman J, Svab I, Ram P, et al. The European Definition Of General Practice / Family Medicine WONCA Europe 2023 Edition. 2023.
- ISCO-08 [Internet]. 2008 [cited 2025 Jun 29]. International Standard Classification of Occupations (ISCO). Available from: <https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/>
- Directive - 2005/36 - EN - EUR-Lex [Internet]. [cited 2025 Jun 29]. Available from: <https://eur-lex.europa.eu/eli/dir/2005/36/oj/eng>
- Directive - 2013/55 - EN - EUR-Lex [Internet]. [cited 2025 Jun 29]. Available from: <https://eur-lex.europa.eu/eli/dir/2013/55/oj/eng>
- Krztoń-Królewiecka A, Švab I, Oleszczyk M, Seifert B, Smithson WH, Windak A. The development of academic family medicine in central and eastern Europe since 1990. BMC Fam Pract [Internet]. 2013 Mar 19 [cited 2025 Apr 15];14(1):1–10. Available from: <https://bmcpimcare.biomedcentral.com/articles/10.1186/1471-2296-14-37>
- Burditt AM. Defining family medicine as a scientific discipline. Canadian Family Physician [Internet]. 2006 Oct [cited 2025 Jun 29];52(10):1206. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC1783608/>
- Godycki-Ćwirko M, Windak A. KLRWP. [cited 2025 Jun 29]. Kolegium Lekarzy Rodzinnych w Polsce. Available from: <https://klrwp.pl/informacje/historia>
- Wróbel P. Rynek Zdrowia. 2022 [cited 2025 Apr 15]. Medycyna rodzinna w Polsce ma 30 lat. Jak wypada jej bilans? Available from: <https://www.rynek-zdrowia.pl/Polityka-zdrowotna/Medycyna-rodzinna-w-Polsce-ma-30-lat-Jak-wypada-jej-bilans,233288,14.html>
- Bujko J. Remedium. 2017 [cited 2025 Apr 15]. Historia medycyny rodzinnej w Polsce - Remedium. Available from: <https://remedium.md/publikacje/opinie/historia-medycyny-rodzinnej-w-polsce>
- PTMR [Internet]. [cited 2025 Jun 29]. Polskie Towarzystwo Medycyny Rodzinnej. Available from: <https://ptmr.info.pl/about/>
- Czasopismo Lekarz POZ [Internet]. [cited 2025 Jun 29]. Available from: https://www.termedia.pl/Czasopismo/Lekarz_POZ-98
- Crowe S, Cresswell K, Robertson A, Huby G, Avery A, Sheikh A. The case study approach. BMC Med Res Methodol [Internet]. 2011 [cited 2025 Jun 29];11:100. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC3141799/>
- Health Needs Map for the Period from January 1, 2022, to December 31, 2026. (Pl. Mapa potrzeb zdrowotnych na okres od 1 stycznia 2022 r. do 31 grudnia 2026 r.) [Internet]. Warsaw; 2021 [cited 2024 Dec 3]. Available from: https://dziennikmz.mz.gov.pl/DUM_MZ/2021/69/akt.pdf
- Guziak M, Walkiewicz M, Nowicka-Sauer K, Šantrić-Milićević M. Future research directions on physicians in Polish primary healthcare: workforce challenges and policy considerations. Crit Public Health [Internet]. 2025 Dec 31 [cited 2025 Jun 29];35(1):2495687. Available from: <https://www.tandfonline.com/doi/abs/10.1080/09581596.2025.2495687>
- Centrum Medyczne Kształcenia Podyplomowego. CMKP. 2023 [cited 2025 Jun 29]. Program specjalizacji w dziedzinie Medycyny Rodzinnej. Available from: <https://www.cmkp.edu.pl/wp-content/uploads/2023/02/0713-program-1.pdf>
- Assessing family medicine trainees-what can we learn from the European neighbours? [cited 2025 Jun 29]; Available from: <http://www.rcgp.org.uk>
- Health at a Glance 2023: OECD Indicators [Internet]. Paris: OECD Publishing; 2023 [cited 2024 Jun 7]. Available from: <https://doi.org/10.1787/7a7afb35-en>
- Verulava T. Factors influencing medical students' choice of family medicine. Family Medicine & Primary Care Review [Internet]. 2022 [cited 2025 Jun 29];24(1):66–70. Available from: <https://doi.org/10.5114/fmpcr.2022.113017>
- Akyön Ş. Determinants Of Choosing Family Medicine As A Specialty For Young Doctors. Ankara City Hospital Medical Journal. 2023 Mar 28;2.
- Gowin E, Horst-Sikorska W, Michalak M, Avonts D, Buczkowski K, Lukas W, et al. The attractiveness of family medicine among Polish medical students. European Journal of General Practice [Internet]. 2014 Jun 26 [cited 2025 Apr 15];20(2):121–4. Available from: <http://www.tandfonline.com/doi/full/10.3109/13814788.2013.826643>
- Jordan J, Brown JB, Russell G. Choosing family medicine What influences medical students? Can Fam Physician. 2003;49:1131–7.
- Krztoń-Królewiecka A, Oleszczyk M, Windak A. Do Polish primary care physicians meet the expectations of their patients? An analysis of Polish QUALICOPC data. BMC Fam Pract [Internet]. 2020 Jun 23 [cited 2025 Jun 30];21(1):1–8. Available from: <https://bmcpimcare.biomedcentral.com/articles/10.1186/s12875-020-01190-1>
- Marcinowicz L, Chlabicz S, Grebowski R. Patient satisfaction with healthcare provided by family doctors: Primary dimensions and an attempt at typology. BMC Health Serv Res [Internet]. 2009 Apr 16 [cited 2025 Jun 30];9(1):1–5. Available from: <https://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-9-63>
- Oleszczyk M, Krztoń-Królewiecka A, Schäfer WLA, Boerma WGW, Windak A. Experiences of adult patients using primary care services in Poland - A cross-sectional study in QUALICOPC study framework. BMC Fam Pract [Internet]. 2017 Nov 22 [cited 2025 Jun 30];18(1):1–13. Available from: <https://bmcpimcare.biomedcentral.com/articles/10.1186/s12875-017-0665-6>
- Pochrząst-Motyczyńska A, Ostrowski J, Sys D, Pinkas J, Religioni U. Patient Satisfaction in Primary and Specialised Ambulatory Healthcare: A Web-Based Cross-Sectional Study in the Polish Population. Healthcare 2025, Vol 13, Page 1147 [Internet]. 2025 May 14 [cited 2025 Jun 30];13(10):1147. Available from: <https://www.mdpi.com/2227-9032/13/10/1147/htm>
- Przybylska D, Przybylski P, Drop B, Czarnocki K, Przybylski W, Drop K, et al. A comparison of the levels of satisfaction with the medical services provided by primary healthcare centers in selected communes. Polish Journal of Public Health [Internet]. 2016 May 8 [cited 2025 Jun 30];126(1):8–12. Available from: <https://czasopisma.umlub.pl/pjph/article/view/1189>

ZNAČAJ PREVENTIVNE ULTRAZVUČNE DIJAGNOSTIKE U PRAVOVREMENOJ DETEKCIJI RETKIH I AGRESIVNIH TIREOIDNIH KARCINOMA – PRIKAZ SLUČAJA

PRIKAZ SLUČAJA

CASE REPORT

SIGNIFICANCE OF THE PREVENTIVE ULTRASOUND DIAGNOSTICS IN THE EARLY DETECTION OF RARE AND AGGRESSIVE THYROID CARCINOMAS – CASE REPORT

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SAŽETAK

Uvod: Medularni karcinom štitaste žlezde (MKŠ) je agresivan tumor udružen sa značajno lošijom prognozom u odnosu na druge tipove tireoidnog karcinoma. Dopler ultrazvučni pregled i adekvatna dijagnostika zasnovana na TIRADS (Thyroid Imaging Reporting and Data System) klasifikaciji suspektih nodusa su neophodni.

Cilj: Ovaj prikaz slučaja naglašava značaj precizne ultrazvučne dijagnostike, presudne u ranoj detekciji i primeni adekvatnih hirurških postupaka u zbrinjavanju ovako agresivnih formi bolesti.

Prikaz slučaja: Prikazujemo pacijentkinju staru 31 godinu koja je ultrazvučno dijagnostikovana rutinskim sistematskim pregledom. Ultrazvučnim pregledom uočen je hipoehogeni, nejasno ograničen mikronodus dimenzija 5 mm x 4 mm x 3 mm, sa ehogenim fokusima lokalizovanim u centralnim zonama levog režnja štitaste žlezde (TIRADS 4, score 6). S obzirom na suspektne maligne ultrazvučne karakteristike, lokalizaciju mikronodusa i sledstveno rađen povišen serumski nivo kalcitonina, postavljena je sumnja na mikromedularni karcinom. Nakon urađene kompletne tiroidektomije, dijagnoza je potvrđena histopatološkim pregledom. Histopatološka analiza pokazuje manji, beličast nodus (5 mm) u levom režnju, bez upadljive nekroze i bez amiloidnog sadržaja. Limfovaskularna invazija nije utvrđena, dok su mitoze retke. Stadijum tumorske bolesti je T1 (pTNM), bez udaljenih metastaza. Hiperplazija C ćelija je prisutna u okolini tumora. Imunohistohe-mijska analiza je pokazala pozitivnu reakciju na kalcitonin, hromogranin i mCEA. Proliferativni indeks je nizak (4%). Nakon hirurške intervencije nivo kalcitonina se normalizovano. Tri godine nakon operacije pacijentkinja je dobrog opšteg stanja, na redovnom praćenju. U međuvremenu se pacijentkinja ostvarila kao majka.

Zaključak: Rana detekcija i pravovremeni terapijski pristup u lečenju mikromedularnog karcinoma štitaste žlezde su vrlo značajni, s obzirom na vrlo agresivno biološko ponašanje ovih tumora. Adekvatan ultrazvučni pregled može značajno promeniti terapijski ishod i prognozu bolesti kod ovakvih pacijenata.

Ključne reči: ultrazvučna dijagnostika, mikronodus štitaste žlezde, mikromedularni karcinom

ABSTRACT

Introduction: Medullary thyroid carcinoma (MTC) is an aggressive tumor associated with a significantly poorer prognosis compared to other types of thyroid cancer. Doppler ultrasound and familiarity with the Thyroid Imaging Reporting and Data System (TIRADS) nodule classification are essential.

Objective: This case highlights the significance of precise ultrasound imaging, crucial for early detection and subsequent management of such aggressive disease.

Case report: We describe the case of a 31-year-old woman who underwent systemic ultrasound imaging. Upon ultrasound examination, a 5 mm x 4 mm x 3 mm hypoechoic, ill-defined solid nodule with echogenic foci (TIRADS 4, score 6) was identified in the mid portion of the left thyroid lobe. Given the suspicious ultrasound features, the location of the nodule, and the elevated serum calcitonin level, the micronodule raised concerns for malignancy, particularly suggesting medullary thyroid microcarcinoma. The patient underwent thyroidectomy, and histopathological analysis confirmed the diagnosis. The histopathology report described a small white nodule (5 mm) in the left lobe. There was no remarkable necrosis, and amyloid deposits were inconspicuous. Lymphovascular invasion was not observed, and mitoses were rare. The tumor stage was T1 (pTNM), and no distant metastases were found. C-cell hyperplasia was noted around the tumor. Immunohistochemical analysis showed positive reactions for calcitonin, chromogranin, and mCEA. The proliferative index was low, approximately 4%. After surgery, serum calcitonin levels decreased. Three years after the surgery, the patient is in good general condition and is under regular monitoring. In the meantime, the patient has become a mother.

Conclusion: Early detection and treatment of micro-MTC are crucial, as these tumors have the potential for aggressive behavior. Adequate ultrasound imaging assessment could significantly improve the prognosis and outcome for these patients.

Keywords: ultrasound imaging, thyroid nodule, micro-medullary carcinoma

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UVOD

Medularni karcinom štitaste žlezde (MKŠ) predstavlja redak tumor koji obuhvata oko 5% svih maligniteta štitaste žlezde. MKŠ je agresivan tumor i ima znatno nepovoljniju prognozu od drugih tipova karcinoma štitaste žlezde [1]. MKŠ je odgovoran za oko 13% smrtnih ishoda povezanih sa karcinomom štitaste žlezde, što ukazuje na njegovu izraženu kliničku agresivnost u poređenju sa folikularnim neoplazmama (FDN) [2]. Njegov potencijal za rano metastaziranje u regionalne limfne čvorove često dovodi do povišenog serumskog nivoa kalcitonina. Iako je potreba za limfadenektomijom u odsustvu palpabilne nodularne bolesti predmet debate, studije ukazuju na to da uspostavljanje normalnog serumskog nivoa kalcitonina korelira sa višom stopom preživljavanja. Integrirana procena ultrazvučnih i biohemijskih parametara pokazala se značajnom u predviđanju prognoze MKŠ-a [1,3].

Serumski kalcitonin predstavlja ključni tumorski marker, sa visokom specifičnošću za MKŠ [4]. Kod pacijenata koji puše ili koriste određene lekove, poput inhibitora protonske pumpe (IPP), mogu se javiti lažno pozitivni rezultati, što smanjuje specifičnost serumskog kalcitonina. U takvim slučajevima dijagnoza se zasniva na kontinuiranom porastu serumskog nivoa kalcitonina tokom vremena, uprkos prekidu upotrebe duvana i terapije inhibitorima protonske pumpe, u kombinaciji sa prisustvom suspektog solitarnog mikronodusa u centralnoj oblasti gornjeg ili srednjeg dela reznja štitaste žlezde [1].

Mikro-MKŠ, koji se obično definiše kao tumor manji od 1 cm, uglavnom se javlja u kontekstu familijarnog MKŠ-a ili kao rezultat inicijative za sprovođenje skrininga nivoa kalcitonina. Ova studija prikazuje lečenje pacijenta sa sporadičnim mikro-MKŠ-om u odsustvu takvih programa skrininga [1,5].

Čvorići na štitastoj žlezdi često se otkrivaju slučajno tokom ultrazvučnih (UZ) pregleda vrata kod odraslih pacijenata. U takvim slučajevima neophodno je sveobuhvatno poznavanje ultrazvučnih karakteristika čvorova pri pregledu visokofrekventnim dopler ultrazvukom, kao i poznavanje klasifikacije čvorova prema TIRADS (Thyroid Imaging Reporting and Data System) sistemu [6,7]. Čvorovi na štitastoj žlezdi sa ultrazvučnim karakteristikama koje upućuju na malignitet, kao što su izražena hipoehogenost, nepravilne ivice, mikrokalcifikacije, „viši nego širi“ oblik i povećana krutost pri elastografiji, zahtevaju aspiracionu biopsiju tankom iglom (FNAC), nakon čega sledi citološka procena prema Bethesda klasifikaciji iz 2010. godine, bez obzira na veličinu čvora. Pored toga, dopler ultrasonografskim pregledom mogu se otkriti dodatne suspektne karakteristike, uključujući dezorganizovane centralne krvne

INTRODUCTION

Medullary thyroid carcinoma (MTC) is a rare tumor, accounting for 5% of thyroid malignancies. MTC is an aggressive tumor, associated with a significantly poorer prognosis compared to other types of thyroid cancer [1]. MTC is responsible for approximately 13% of deaths related to thyroid cancer, indicating its considerable clinical aggressiveness compared to follicular-derived neoplasms (FDN) [2]. Its potential to metastasize to regional lymph nodes early in its progression often results in elevated serum calcitonin levels. While the necessity of lymphadenectomy in the absence of palpable nodal disease sparks debate, studies have shown that successful normalization of serum calcitonin levels correlates with enhanced survival. A combined assessment of ultrasound and biochemical features is associated with the prognosis of MTC [1,3].

Serum calcitonin serves as a key tumor marker and is highly specific for MTC [4]. Patients who smoke or use certain medications, such as proton-pump inhibitors (PPIs), may induce false-positive results, thereby reducing the specificity of serum calcitonin. In such cases, diagnosis is based on a continuous rise in serum calcitonin levels over time, despite discontinuation of tobacco use and PPI therapy, combined with the presence of a suspicious solitary micronodule in the central region of the upper/mid thyroid lobe [1].

The concept of micro-MTC, typically defined as MTC measuring less than 1 cm, has predominantly emerged within familial MTC contexts or as a result of calcitonin screening initiatives. This study describes the management of patients with sporadic micro-MTC in the absence of such screening programs [1,5].

Thyroid nodules are commonly discovered incidentally during neck ultrasound (US) examinations in adults. In such instances, a comprehensive understanding of thyroid nodule characteristics on high-frequency Doppler ultrasound and familiarity with the Thyroid Imaging Reporting and Data System (TIRADS) nodule classification are essential [6,7]. Thyroid nodules with ultrasound features suggestive of malignancy, such as marked hypoechogenicity, irregular margins, microcalcifications, a taller-than-wide shape, and high stiffness on elastography, warrant fine-needle aspiration cytology (FNAC), followed by cytological evaluation according to the 2010 Bethesda classification, regardless of nodule size. Additionally, Doppler US evaluation may reveal supplementary suspicious features, including disorganized central vasculature and a high resistance index (RI > 0.75). MTC may also exhibit distinctive US Doppler features [1,8].

The natural history of MTC has been difficult to delineate due to its rarity. The significance of medullary

sudove i visok indeks otpora (RI > 0,75). MKŠ takođe može imati karakteristične ultrazvučne osobine [1,8].

Prirodni tok MKŠ-a je teško odrediti zbog njegove niske učestalosti. Klinički značaj medularnih mikrokarcinoma i dalje nije razjašnjen, iako se često otkrivaju, uglavnom u okviru programa skrininga nivoa kalcitonina. Nivoi serumskog kalcitonina iznad 100 pg/mL obično ukazuju na makro-MKŠ [1]. Ovaj nedostatak konsenzusa odnosi se i na klinički značaj i optimalno lečenje mikro-MKŠ-a, posebno kada je reč o sporadičnim i okultnim formama [1,2].

Ova studija ističe značaj preciznog ultrazvučnog skeniranja, koje je od ključnog značaja za rano otkrivanje i dalje lečenje, u cilju sprečavanja nepovoljne prognoze kod ove agresivne bolesti.

STUDIJA SLUČAJA

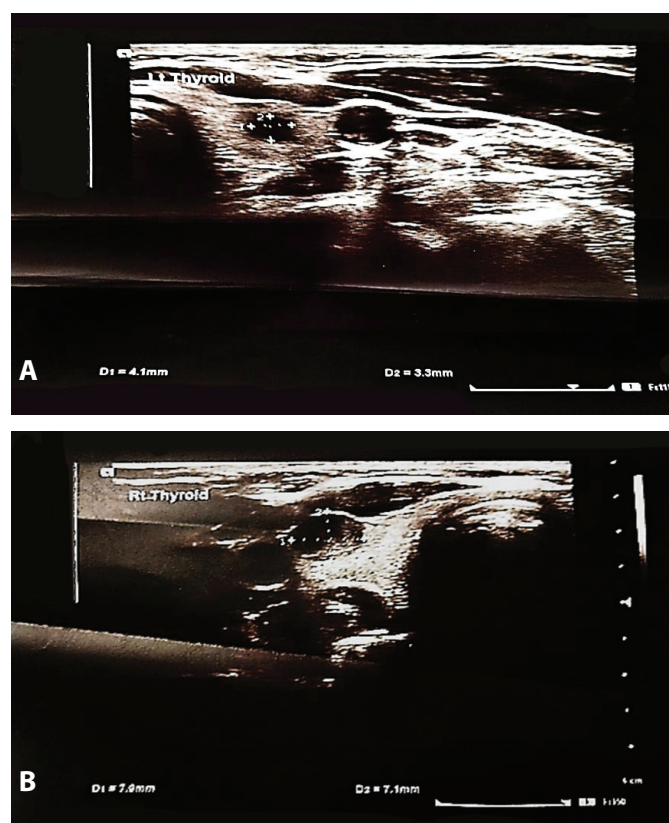
Prikazujemo slučaj 31-godišnje pacijentkinje koja je ultrazvučno dijagnostikovana rutinskim sistematskim pregledom. Ultrazvučnim pregledom uočen je hipoehogeni, nejasno ograničen nodus dimenzija 5 mm x

microcarcinomas remains elusive despite their frequent detection, often through calcitonin screening programs. Serum calcitonin levels above 100 pg/mL are generally indicative of macro-MTC [1]. This lack of consensus extends to the clinical significance and optimal management of micro-MTC, particularly within sporadic and occult settings [1,2].

This study highlights the significance of precise ultrasound imaging, crucial for early detection and further management, in order to prevent a poor prognosis for such an aggressive disease.

CASE REPORT

We describe a 31-year-old woman who underwent systemic ultrasound imaging. Upon ultrasound examination, a 5 mm x 4 mm x 3 mm hypoechoic ill-defined nodule with echogenic foci (TIRADS 4) was identified in the mid portion of the left thyroid lobe (Figure 1). Additionally, her serum calcitonin level was measured at 17.7 pg/mL. Serum calcitonin was repeated several times over a three-month period. Given the suspicious



Slika 1. Ultrazvučni pregled štitaste žlezde pacijenta. Ultrazvučni pregled štitaste žlezde prikazuje sumnjiv čvor u levom režnju. A i B. Mali hipoehogeni, solidni čvor veličine 5 mm sa ehogenim fokusima, prisutnom vaskularizacijom i nepravilnim marginama (TIRADS 4, skor 6), lociran u srednjem delu levog režnja štitaste žlezde. C. U kontralateralnom desnom režnju, anteriorno i kranijalno, prikazan je mešoviti, pretežno cistični čvor veličine 9 mm sa centralnom vaskularizacijom; za razliku od levog čvora, ima drugačiju ultrazvučnu sliku i ne pokazuje sumnjive karakteristike maligne lezije.

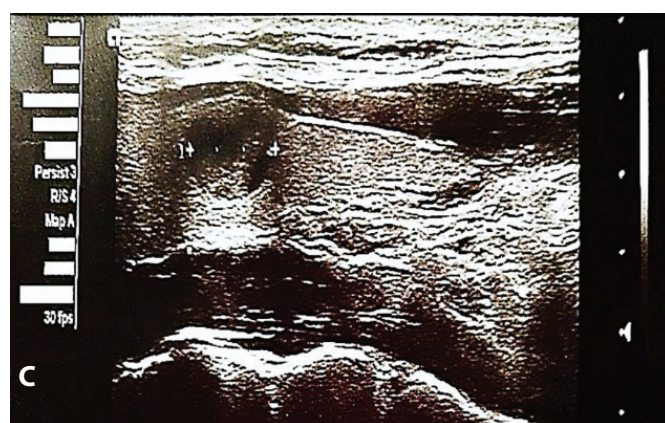


Figure 1. Ultrasound imaging of the patient's thyroid gland. Ultrasound examination of the thyroid gland detected a suspicious nodule in the left lobe. A. and B. Small hypoechoic, solid nodule (5mm) with echogenic foci, vascularization and irregular margins (TIRADS4, score 6) in the mid portion of the left thyroid lobe. C. In the contralateral right lobe, anterior and cranial, there was a mixed, predominantly cystic nodule measuring 9 mm with central vascularization. Unlike the left nodule, this lesion displayed a different imaging pattern and lacked suspicious malignant features

4 mm x 3 mm, sa ehogenim fokusima (TIRADS 4) lokalizovanim u centralnim zonama levog režnja štitaste žlezde (Slika 1). Pored toga, kod pacijentkinje je izmeren serumski nivo kalcitonina, koji je iznosio 17,7 pg/mL. Serumski kalcitonin je ponovo meren više puta tokom tromesečnog perioda. S obzirom na suspektne ultrazvučne karakteristike, lokalizaciju nodusa i povišen serumski nivo kalcitonina, mikronodus je ukazao na postojanje maligniteta, posebno imajući u vidu mikromedularni karcinom.

Pacijentkinja je upućena u tercijarnu ustanovu radi dalje dijagnostike štitaste žlezde. Potom je podvrgnuta tireoidektomiji, a histopatološka analiza je potvrdila dijagnozu. Preoperativna biopsija kod pacijentkinje nije rađena. U histopatološkom izveštaju opisan je mali beličast nodus u levom režnju, prečnika 5 mm (Slika 2). Nije bilo upadljive nekroze i amiloidnog sadržaja. Limfovaskularna invazija nije utvrđena, dok su mitoze bile retke. Stadijum tumorske bolesti bio je T1 (pTNM). Status limfnih čvorova nije histopatološki procenjivan, a udaljene metastaze nisu pronađene. Oko tumora je uočena hiperplazija C-ćelija, dok je ostatak tkiva štitaste žlezde pokazivao stromalne promene.

Imunohistohemijska analiza je pokazala pozitivnu reakciju na kalcitonin, hromogranin i mCEA. Imunohistohemijsko bojenje na markere HBME, CD56, CK19 i galektin-3 bilo je negativno. S100 je bio prisutan u retkim, pojedinačnim ćelijama. Proliferativni indeks je bio nizak, približno 4%.

Pacijentkinja nije prijavila slična oboljenja niti genetsku predispoziciju u porodičnoj anamnezi. Nakon operacije, serumski nivo kalcitonina je opao. Genetska analiza nije otkrila specifične promene povezane sa detektovanim MKŠ-om, što ukazuje na sporadičnu formu bolesti.

Pacijentkinja je upućena na kliničko i radiološko praćenje, koje uključuje redovno merenje nivoa serumskog kalcitonina i detaljne kliničke preglede. Ultrazvučni pregledi se obavljaju na svakih šest meseci.

ultrasound features, the location of the nodule, and the elevated serum calcitonin level, the micronodule raised concerns for malignancy, particularly suggesting medullary thyroid microcarcinoma.

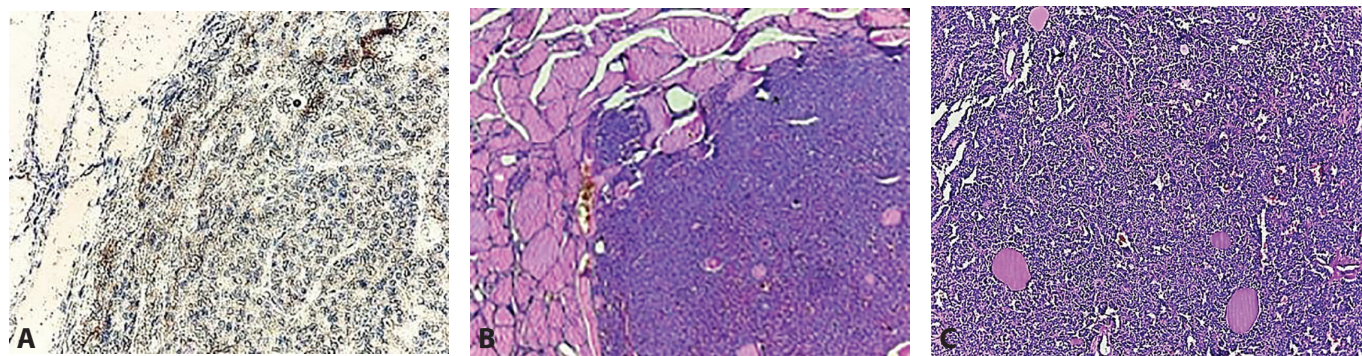
The patient was referred to a tertiary institution for further investigation of her thyroid gland. Subsequently, she underwent thyroidectomy, and histopathological analysis confirmed the diagnosis. The patient did not undergo a preoperative biopsy. The histopathology report described a small white nodule in the left lobe, with a diameter of 5 mm (Figure 2). There was no remarkable necrosis, and amyloid was inconspicuous. Lymphovascular invasion was not observed, and mitoses were rare. The tumor stage was T1 (pTNM). Lymph node status was not evaluated histopathologically, and no distant metastases were found. C-cell hyperplasia was observed around the tumor, and the rest of the thyroid tissue showed stromal changes.

Immunohistochemical analysis showed positive reactions for calcitonin, chromogranin, and mCEA. Negative staining was observed with HBME, CD56, CK19, and galectin-3. S100 was found in rare, single cells. The proliferative index was low, approximately 4%.

The patient did not report any similar disease or genetic inheritance in her family history. After surgery, serum calcitonin levels decreased. The genetic analysis performed did not reveal any specific alterations associated with the detected MTC, suggesting a sporadic form of the disease.

The patient was referred for clinical and imaging follow-up, which includes regular serum calcitonin measurements and thorough clinical examinations. Ultrasound examinations are performed every six months.

Three years after the surgery, the patient is in good general condition and is under regular monitoring. In the meantime, the patient has become a mother.



Slika 2. Histopatološki nalaz. Histopatološki prikaz mikromedularnog karcinoma štitaste žlezde (A. uvećanje x50) i (B. uvećanje x100). Imunohistohemijska analiza na kalcitonin pokazuje pozitivnu reakciju u neoplastičnim ćelijama (C. uvećanje x400)

Figure 2. Histopathology examination. Histopathology pattern of micro-medullary thyroid carcinoma (A. x50) and (B. x100). Immunohistochemical analysis with calcitonin shows positive reaction in neoplastic cells (C. x400)

Tri godine nakon operacije, pacijentkinja je u dobrom opštem stanju i njeno stanje se redovno prati. U međuvremenu, pacijentkinja je postala majka.

DISKUSIJA

Mikro-medularni karcinomi se često slučajno otkrivaju tokom preventivne tireoidektomije. Zahvaljujući napretku ultrazvučne tehnologije, sada je moguće otkriti manje noduse pre donošenja odluke o hirurškom tretmanu. Rano hirurško uklanjanje tumora značajno povećava šanse za izlečenje kod pacijenata sa mikro-MKŠ-om [2].

S obzirom na male dimenzije mikro-MKŠ-a, tokom kliničkog praćenja nisu zabeleženi slučajevi recidiva tumora niti udaljenih metastaza. Preovlađujuće mišljenje u literaturi ukazuje na to da je mikro-MKŠ povezan sa višim stopama izlečenja i nižim rizikom od metastaza i smrtnosti u poređenju sa većim tumorima, pri čemu samo retki slučajevi pokazuju klinički agresivno ponašanje [9]. I naši nalazi idu u prilog ovom mišljenju.

Pošto na prognozu MKŠ-a značajno utiču volumen tumora i stepen njegovog širenja, radiolozi moraju biti vešti u prepoznavanju specifičnih ultrazvučnih karakteristika koje su svojstvene MKŠ-u. Rana i precizna dijagnoza od ključnog je značaja za optimalno hirurško lečenje i dugoročne ishode kod pacijenata sa ovim agresivnim tumorom [1,8].

MKŠ se obično javlja u centralnoj oblasti gornjeg ili srednjeg dela reznja štitaste žlezde, gde su koncentrisane C (parafolikularne) ćelije. Radiolozi treba da obrate pažnju na prisustvo hiperehogenih tačkica na ultrazvučnim snimcima, koje mogu odgovarati depozitima amiloidnog sadržaja ili kalcifikacijama. Takvi nalazi treba da navedu radiologa da sprovede aspiracionu biopsiju tankom iglom (FNAC) radi daljeg ispitivanja [10]. S obzirom na povezanost MKŠ-a i multiple endokrine neoplazije (posebno RET mutacija), radiolozi treba posebno da obrate pažnju na eventualno uvećanje paratireoidnih žlezda koje se nalaze iza reznja štitaste žlezde, medijalno u odnosu na karotidne ovojnice vrata [1].

Iako su neki slučajevi MKŠ-a povezani sa multiplom endokrinom neoplazijom (MEN) tipa IIa ili IIb, većina ovih tumora nastaje sporadično. Tokom patohistološke analize uzoraka štitaste žlezde uzetih zbog sumnje na benigne bolesti ili ne-medularne karcinome štitaste žlezde, zabeleženo je otkrivanje malih (manjih od 1 cm), okultnih MKŠ-ova, poznatih kao mikro-MKŠ, kako kod pacijenata sa porodičnom istorijom MEN-a ili MKŠ-a, tako i kod onih bez takve istorije. Prognostičke implikacije i optimalno hirurško lečenje sporadičnih formi mikro-MKŠ-a i dalje nisu jasno definisani [1,11].

Većina slučajeva MKŠ-a ima sporadičnu formu i javljaju se nezavisno od porodične predispozicije. Međutim, do 25% slučajeva MKŠ-a povezano je sa jednim

DISCUSSION

Micro-medullary carcinomas are often detected incidentally during prophylactic thyroidectomy procedures. Advancements in ultrasound technology now enable the detection of smaller nodules before surgical decisions are made. Early resection offers a significant possibility of cure in micro-MTC cases [2].

Considering the small size of micro-MTC, no cases of tumor recurrence or distant metastases were observed during clinical follow-up. The prevailing notion in the literature indicates that micro-MTCs are associated with higher cure rates and a lower risk of metastases and mortality compared to larger tumors, with only rare cases exhibiting clinically aggressive behavior [9]. Our findings further support this notion.

Since the prognosis of MTC is strongly influenced by tumor volume and extent of spread, radiologists must be proficient in identifying specific imaging features characteristic of MTC. Early and accurate diagnosis is paramount for optimizing surgical management and long-term outcomes in patients with this aggressive tumor [1,8].

MTC typically originates in the upper or mid portion of the central thyroid lobe, where C (parafollicular) cells are concentrated. Radiologists should be alert to the presence of hyperechoic punctuations on ultrasound imaging, which may correspond to amyloid deposits or calcifications. Such findings should prompt the radiologist to perform a fine needle aspiration cytology (FNAC) for further evaluation [10]. Given the association between MTC and multiple endocrine neoplasia (especially RET mutations) radiologists should carefully evaluate for enlarged parathyroid glands situated posterior to the thyroid lobes, medial to the cervical carotid sheaths [1].

While some cases of MTC are associated with multiple endocrine neoplasia (MEN) types IIa or IIb, the majority arise sporadically. The discovery of small (less than 1 cm) occult MTCs, known as micro-MTCs, during pathological examination of thyroid specimens resected for benign conditions or non-MTC thyroid cancers, has been reported in both patients with and without familial histories of MEN or MTC. The prognostic implications and optimal surgical management of sporadic micro-MTC remain unclear [1,11].

The majority of MTC cases are sporadic, occurring without a familial predisposition. However, up to 25% of cases are associated with one of three familial syndromes: Multiple Endocrine Neoplasia type 2A (MEN2A), Multiple Endocrine Neoplasia type 2B (MEN2B), and Familial Medullary Thyroid Carcinoma (FMTTC). These familial cases are attributed to germline gain-of-function autosomal-dominant mutations in the

od tri nasledna sindroma: multiplom endokrinom neoplazijom tipa 2A (MEN2A), multiplom endokrinom neoplazijom tipa 2B (MEN2B) i familijarnim medularnim karcinomom štitaste žlezde (FMTC). Ovi nasledni slučajevi se pripisuju germinativnim autozomno-dominantnim mutacijama sa sticanjem funkcije (gain-of-function) u protoonkogenu RET [2,5]. Germinativna RET K666N mutacija koja nastaje na jednom alelu povezuje se sa rizikom od dobijanja naslednog MKŠ-a, pri čemu se ekspresivnost menja u zavisnosti od starosti. Međutim, ove varijante pokazuju nižu penetrabilnost za druge tumore koji su karakteristični za MEN2 sindrom [12].

Sporadična forma MKŠ-a se obično javlja kao palpabilan nodus štitaste žlezde kod osoba u dobi između pete i šeste decenije života. Nasuprot tome, nasledna forma se javlja u mlađem uzrastu, a klinička slika varira u zavisnosti od pridruženog sindroma. Na primer, MEN2A karakteriše prisustvo feohromocitoma i hiperparatiroidizma, dok je MEN2B povezan sa pojavama kao što su feohromocitom, mukozni neuromi i Marfanov sindrom. Važno je napomenuti da se nasledna forma MKŠ-a često javlja multifokalno ili bilateralno i da je često povezana sa hiperplazijom C-ćelija [2,13,14].

Razlikovanje MKŠ-a od češćih maligniteta štitaste žlezde, kao što je papilarni karcinom štitaste žlezde (PTC), samo uz pomoć ultrazvučne dijagnostike može predstavljati izazov. Neke studije sugerišu da kombinovanje različitih TIRADS sistema skorovanja poboljšava dijagnostičku preciznost [15], dok su druge pokazale efikasnost modela radiomike u razlikovanju ovih entiteta [16]. Ultrazvučna procena vaskularizacije može pomoći pri razlikovanju MKŠ-a od benignih nodusa štitaste žlezde. MKŠ se odlikuje prepoznatljivom infiltrativnom razgranatom vaskularizacijom. Integrisanje ovih vaskularnih karakteristika u ultrazvučne sisteme za procenu rizika može poboljšati prepoznavanje MKŠ-a kod nodusa sa niskom do srednjom suspektnošću i omogućiti preciznije kliničko vođenje pacijenata [17]. Savremene metode snimanja MKŠ-a istakle su značaj jedinjenja usmerenog na CCK2 receptor (CCK2 R-Targeting Compound) [18].

Donošenje odluka o lečenju slučajno otkrivenog sporadičnog mikro-MKŠ-a predstavlja izazov, posebno kada je reč o hirurškom pristupu i zbrinjavanju metastaza koje su otkrivene biohemijskim ili radiološkim putem. U slučajevima u kojima je MKŠ dijagnostikovao pre operacije, rutinski se izvodi totalna tireoidektomija sa disekcijom limfnih čvorova u centralnom delu. Disekcija bočnih limfnih čvorova rezervisana je za slučajeve kod kojih postoji klinički značajna zahvaćenost nodusa [5].

Prethodna istraživanja ukazuju na povezanost manje agresivnog fenotipa sa manjim, slučajno otkrivenim tumorima. Važno je napomenuti da su vaskularna

RET proto-oncogene [2,5]. Monoallelic germline RET K666N mutations are associated with a risk of developing familial MTC, exhibiting age-dependent expressivity. However, these variants show low penetrance for other tumors typically seen in MEN2 syndromes [12].

Sporadic MTC typically presents with a palpable thyroid nodule in individuals aged between their 5th and 6th decades of life. In contrast, familial cases tend to occur at a younger age, and their presentation varies depending on the associated syndrome. For instance, MEN2A is characterized by the presence of pheochromocytoma and hyperparathyroidism, while MEN2B is associated with features such as pheochromocytoma, mucosal neuromas, and a marfanoid habitus. Importantly, familial MTC cases often present multifocally or bilaterally and are frequently associated with C-cell hyperplasia [2,13,14].

Differentiating MTC from more common thyroid malignancies such as papillary thyroid carcinoma (PTC) using ultrasound examination alone can be challenging. Some studies have suggested that combining various TIRADS scoring systems improves diagnostic accuracy [15], while others have demonstrated the effectiveness of radiomics models in distinguishing between these entities [16]. Evaluation of vascularity characteristics on ultrasound can assist in differentiating MTC from benign thyroid nodules. MTC is notably characterized by a distinctive penetrating branching vascular pattern. Integrating these vascular features into ultrasound-based risk stratification systems may enhance the identification of MTC among nodules with low to intermediate suspicion, thus facilitating more precise clinical management [17]. Novel imaging methods for MTC have highlighted the significance of CCK 2 R-Targeting Compound [18].

Navigating treatment decisions for incidentally discovered sporadic micro-MTC poses challenges, especially concerning the surgical approach and management of biochemical or radiologically detected metastatic disease. In cases with a preoperative diagnosis of MTC, total thyroidectomy with central compartment lymph node dissection is routinely performed. Lateral neck dissections are reserved for cases with clinically relevant nodal involvement [5].

Previous studies have described a correlation between a less aggressive phenotype and smaller, incidentally found tumors. Notably, only tumors larger than 0.5 cm exhibited evidence of vascular invasion or extrathyroidal extension. Desmoplastic reactions were also observed, with larger tumors more likely to exhibit such reactions. However, the relationship between desmoplasia, tumor size, and the presence of nodal metastases could not be conclusively established [1,5].

invazija i ekstratiroidna ekstenzija primećeni samo kod tumora većih od 0,5 cm. Uočene su i dezmodoplastične reakcije, pri čemu su ovakve promene bile češće kod većih tumora. Ipak, nije bilo moguće sa sigurnošću utvrditi odnos između dezmodoplazije, veličine tumora i prisustva limfnih metastaza [1,5]. Procena ekspresije Ki-67 predstavlja prediktivni histopatološki parametar koji se može koristiti zajedno sa ultrazvučnim karakteristikama za procenu agresivnosti MKŠ-a [19].

Medularni karcinom štitaste žlezde (MKŠ) predstavlja značajan klinički izazov jer pokazuje ograničenu osetljivost na hemioterapiju i radioterapiju. Shodno tome, osnovna strategija lečenja zasniva se prvenstveno na hirurškom odstranjivanju štitaste žlezde uz disekciju limfnih čvorova. Limfni čvorovi su zahvaćeni u značajnom broju slučajeva, naročito kod pacijenata sa uznapredovalim tumorima (klasifikovanim kao T3 i T4), što ukazuje na agresivnu prirodu ove maligne bolesti. Stoga je rana preoperativna dijagnostika ključna za planiranje lečenja, koje se obično sprovodi kombinovanjem preoperativne aspiracione biopsije tankom iglom i određivanjem nivoa serumskog kalcitonina [2,20].

Rutinska preventivna skrining dijagnostika MKŠ-a u opštoj populaciji prvenstveno se zasniva na određivanju nivoa serumskog kalcitonina, a ne na preventivnoj ultrazvučnoj dijagnostici. Ultrazvučna dijagnostika se obično razmatra kod pacijenata kod kojih su stalno povišene vrednosti kalcitonina. Uprkos niskoj učestalosti mikro-medularnog karcinoma štitaste žlezde i činjenici da ultrazvuk nije standardna metoda skrininga za ovu bolest, adekvatan i precizan inicijalni radiološki pregled može značajno uticati na klinički tok, posebno kada se bolest otkrije u ranoj fazi [10,21].

Preporučuje se da se preventivna tireoidektomija obavi do pete godine života ili ranije, naročito kod pacijenata sa povišenim serumskim kalcitoninom. Međutim, ispoljavanje i progresija bolesti unutar visokorizičnih grupa mogu značajno da variraju. Shodno tome, vreme izvođenja profilaktičke tireoidektomije više se ne određuje samo na osnovu genotipa, već na osnovu individualizovanih kliničkih parametara, sa posebnim naglaskom na koncentraciju serumskog kalcitonina [11].

ZAKLJUČAK

Iako je mikro-medularni karcinom štitaste žlezde redak patološki entitet i ultrazvuk nije standardna skrining metoda za njegovo otkrivanje, rano dijagnostikovanje je svakako od suštinskog značaja zbog potencijalno agresivnog ponašanja ovog tumora. Merenje nivoa serumskog kalcitonina i dalje predstavlja primarni alat za njegovo rano otkrivanje; međutim, kod pacijenata sa povišenim ili stalno rastućim nivoom kalcitonina, ciljana i precizna ultrazvučna dijagnostika može imati

Assessment of Ki-67 expression represents a predictive histopathological parameter that can be used alongside ultrasonographic features to evaluate the aggressiveness of MTC [19].

Medullary thyroid carcinoma (MTC) poses a significant clinical challenge as it exhibits limited responsiveness to chemotherapy and radiation therapy. Consequently, the cornerstone of its management primarily revolves around surgical excision of the thyroid gland with lymph node dissection. Lymph node involvement is prevalent in a considerable proportion of cases, particularly in patients with advanced tumors (T3–T4 tumors), highlighting the aggressive nature of this malignancy. Therefore, early preoperative diagnosis is crucial to facilitate appropriate treatment planning, typically achieved through preoperative fine needle aspiration analysis in conjunction with serum calcitonin measurements [2,20].

Routine preventive screening for MTC in the general population is primarily based on the measurement of serum calcitonin levels, rather than prophylactic ultrasound examination. Ultrasound imaging is typically considered in patients with persistently elevated calcitonin levels. Despite the low incidence of micro-medullary thyroid carcinoma and the fact that ultrasound is not a standard screening method for this disease, an adequate and precise primary radiological examination can significantly influence the clinical course, especially when the disease is detected at an early stage [10,21].

Prophylactic thyroidectomy is generally recommended by the age of five or earlier, especially in the presence of elevated serum calcitonin levels. However, the expression and progression of the disease within high risk categories can vary significantly. Consequently, the timing of prophylactic thyroidectomy is no longer based only on genotype, but rather on individualized clinical parameters, with particular emphasis on serum calcitonin concentrations [11].

CONCLUSION

Although micro-medullary thyroid carcinoma is a rare entity and ultrasound is not a standard screening method for its detection, early diagnosis remains essential due to the tumor's potential for aggressive behavior. Serum calcitonin measurement continues to be the primary tool for early detection; however, in patients with elevated or persistently rising calcitonin levels, targeted and precise ultrasound imaging can play a critical role. An accurate initial radiological assessment, particularly when the disease is detected at an early stage, can significantly influence the clinical course, improve prognosis, and contribute to better patient outcomes.

ključnu ulogu. Precizna inicijalna radiološka procena, naročito kada je bolest otkrivena u ranoj fazi, može značajno uticati na klinički tok, poboljšati prognozu i doprineti boljim ishodima lečenja.

IZJAVE:

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Saglasnost za objavljivanje: Pacijentkinja je potpisala informisani pristanak za objavljivanje svojih podataka. Svi autori su učestvovali u koncipiranju i dizajnu studije.

Sukob interesa: Nije prijavljen

LITERATURA / REFERENCES

- Pillarsetty VG, Katz SC, Ghossein RA, Tuttle RM, Shaha AR. Micromedullary thyroid cancer: how micro is truly micro? *Ann Surg Oncol*. 2009 Oct;16(10):2875-81. doi: 10.1245/s10434-009-0595-1.
- Samulski TD, Livolsi VA, Montone K, Baloch Z. The variable pathologic presentations of medullary and micro-medullary thyroid carcinoma: an institutional experience. *Pathol Res Pract*. 2014 Mar;210(3):182-5. doi: 10.1016/j.prp.2013.12.004.
- Zhao J, Yang F, Wei X, Mao Y, Mu J, Zhao L, et al. Ultrasound features value in the diagnosis and prognosis of medullary thyroid carcinoma. *Endocrine*. 2021 Jun;72(3):727-34. doi: 10.1007/s12020-020-02510-2.
- Trimboli P, Mian C, Piccardo A, Treglia G. Diagnostic tests for medullary thyroid carcinoma: an umbrella review. *Endocrine*. 2023 Aug;81(2):183-93. doi: 10.1007/s12020-023-03326-6.
- Ospina NS, Maraka S, Donegan D, Morris JC. Clinical features of a family with multiple endocrine neoplasia type 2A caused by the D631Y RET mutation. *Thyroid*. 2017 Oct;27(10):1332-4. doi: 10.1089/thy.2016.0536.
- Grani G, Sponziello M, Filetti S, Durante C. Thyroid nodules: diagnosis and management. *Nat Rev Endocrinol*. 2024 Dec;20(12):715-28. doi: 10.1038/s41574-024-01025-4.
- Matrone A, Gambale C, Biagini M, Prete A, Vitti P, Elisei R. Ultrasound features and risk stratification systems to identify medullary thyroid carcinoma. *Eur J Endocrinol*. 2021 Jun 28;185(2):193-200. doi: 10.1530/EJE-21-0313.
- Sipos JA. the history of thyroid ultrasound: past, present, and future directions. *Endocr Pract*. 2024 Dec;30(12):1220-6. doi: 10.1016/j.epr.2024.08.010.
- Gui Z, Wang Z, Xiang J, Sun W, He L, Dong W, et al. Incidental T1 stage medullary thyroid carcinoma: the effect of tumour diameter on prognosis and therapeutic implications. *Clin Endocrinol (Oxf)*. 2022 Sep;97(3):355-62. doi: 10.1111/cen.14702.
- Trimboli P, Mian C, Piccardo A, Treglia G. Diagnostic tests for medullary thyroid carcinoma: an umbrella review. *Endocrine*. 2023 Aug;81(2):183-93. doi: 10.1007/s12020-023-03326-6.
- Frank-Raue K, Raue F. Hereditary medullary thyroid cancer: genotype-phenotype correlation. *Recent Results Cancer Res*. 2025;223:183-209. doi: 10.1007/978-3-031-80396-3_7.
- Yip AT, Kim TH, Peluso EM, Jacobsen SE, Yeh MW, Lechner MG. Medullary thyroid carcinoma and clinical outcomes in heterozygous carriers of the RET K666N germline pathogenic variant. *JCEM Case Rep*. 2025 Feb 17;3(3):luaf002. doi: 10.1210/jcemcr/luaf002.
- Pacini F, Castagna MG, Cipri C, Schlumberger M. Medullary thyroid carcinoma. *Clin Oncol (R Coll Radiol)*. 2010 Aug;22(6):475-85. doi: 10.1016/j.clon.2010.05.002.
- Hamy A, Pessaux P, Mirallié E, Mucci-Hennekinne S, Gibelin H, Mor-Martinez C, et al. Central neck dissection in the management of sporadic medullary thyroid microcarcinoma. *Eur J Surg Oncol*. 2005 Sep;31(7):774-7. doi: 10.1016/j.ejso.2005.03.007.
- Li X, Yao J, Zhan W, Zhou W. Ultrasonographic differentiation of medullary thyroid carcinoma from papillary thyroid carcinoma: quantitative comparison of morphologic features and different TIRADS risk categorizations. *BMC Med Imaging*. 2025 May 26;25(1):189. doi: 10.1186/s12880-025-01679-0.
- Zhang D, Yang F, Hou W, Wang Y, Mu J, Wang H, et al. Ultrasonic radiomics in predicting pathologic type for thyroid cancer: a preliminary study using radiomics features for predicting medullary thyroid carcinoma. *Front Endocrinol (Lausanne)*. 2025 Feb 19;16:1428888. doi: 10.3389/fendo.2025.1428888.
- Gao L, Ma L, Li X, Liu C, Li N, Lian X, et al. Using preoperative ultrasound vascularity characteristics to estimate medullary thyroid cancer. *Cancer Imaging*. 2023 Jun 20;23(1):64. doi: 10.1186/s40644-023-00583-6.
- Viering O, Rinscheid A, Holzleitner N, Dierks A, Kircher M, Wienand G, et al. Biodistribution and radiation dosimetry for 68 Ga-DOTA-CCK-66, a novel CCK 2 R-targeting compound for imaging of medullary thyroid cancer. *Clin Nucl Med*. 2024 Dec 1;49(12):1091-7. doi: 10.1097/RLU.00000000000005355.
- Zhang Q, Hu Y, Chen X, Yang Z, Li X, Ni X, et al. Preoperative prediction of Ki-67 expression in medullary thyroid carcinoma based on ultrasonographic features: a 10-year retrospective study. *Eur J Radiol*. 2025 Jul;188:112134. doi: 10.1016/j.ejrad.2025.112134.
- Deandrea M, Piticchio T, Mormile A, Retta F, Canale G, Caracciolo A, et al. Preoperative neck ultrasound combined with pathological data can significantly impact the outcome of medullary thyroid carcinoma. *Endocr J*. 2023 Nov 28;70(11):1061-7. doi: 10.1507/endocrj.EJ23-0273.
- Delorme S, Raue F, Beuthien-Baumann B. Medullary thyroid carcinoma: imaging. *Recent Results Cancer Res*. 2025;223:129-53. doi: 10.1007/978-3-031-80396-3_5.

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SKLEROHOROIDALNA KALCIFIKACIJA – DIFERENCIJALNO-DIJAGNOSTIČKA DILEMA: PRIKAZ SLUČAJA

PRIKAZ SLUČAJA

CASE REPORT

SCLEROCHOROIDAL CALCIFICATION MIMICKING CHOROIDAL OSTEOMA: A CASE REPORT

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SAŽETAK

Uvod: Sklerohoroidalne kalcifikacije predstavljaju retke, benigne očne promene koje se karakterišu odlaganjem kalcijuma i fosfata u skleri i susednoj horioidi. Najčešće se otkrivaju tokom rutinskih oftalmoloških pregleda, naročito kod starijih osoba, a svojim kliničkim izgledom mogu da imitiraju ozbiljnije intraokularne tumore. Zbog toga je precizna dijagnoza od ključne važnosti.

Prikaz slučaja: Prikaz slučaja 62-godišnjeg muškarca upućenog na evaluaciju subretinalne lezije lokalizovane na periferiji očnog dna levog oka, koja je prvobitno otkrivena tokom rutinskog oftalmološkog pregleda. Pacijent nije imao tegobe niti promene u vidu. Pregled očnog dna otkrio je žućkastu, plakoidnu promenu sa nejasnim granicama, lokalizovanu suprapapilarno, između gornjih vaskularnih arkada. Ultrazvučni pregled (B-sken) potvrdio je prisustvo lezije visoke unutrašnje reflektivnosti uz prisutnu akustičnu senku, što ukazuje na kalcifikaciju. Fluoresceinska angiografija pokazala je hipofluorescentnu promenu bez propuštanja boje ili kasnog nakupljanja iste. Na osnovu kliničkog pregleda, ultrazvučnog nalaza i rezultata fluoresceinske angiografije, postavljena je dijagnoza sklerohoroidalne kalcifikacije.

Zaključak: Sklerohoroidalne kalcifikacije mogu klinički i ultrazvučno imitirati ozbiljnije intraokularne promene. Dodatna dijagnostika poput ultrazvuka oka i fluoresceinske angiografije, ima ključnu ulogu u razlikovanju ovih benignih lezija. Kod asimptomatskih pacijenata bez znakova progresije, preporučuje se praćenje na godišnjem nivou bez potrebe za terapijskom intervencijom.

Ključne reči: sklerohoroidalna kalcifikacija, osteom sudovnjače, fluoresceinska angiografija, kalcifikovane intraokularne lezije

ABSTRACT

Introduction: Sclerochoroidal calcifications are uncommon, benign ocular findings characterized by the deposition of calcium and phosphate within the sclera and adjacent choroid. These lesions are most frequently discovered incidentally during routine ophthalmologic evaluation, particularly in elderly individuals, and may resemble more serious intraocular pathologies.

Case report: We present the case of a 62-year-old male patient referred for evaluation of a subretinal lesion in the peripheral retina of the left eye, initially detected during a routine ophthalmologic examination. The patient was asymptomatic, with no visual complaints. Fundus examination revealed a yellowish, placoid lesion with indistinct borders located suprapapillary, between the superior vascular arcades. B-scan ultrasonography demonstrated high internal reflectivity with posterior acoustic shadowing. Fluorescein angiography revealed a hypofluorescent lesion without leakage or staining. The lesion remained stable over several years, and systemic workup showed no evidence of metabolic abnormalities. Based on clinical and imaging findings (B-scan ultrasonography and fluorescein angiography), the diagnosis of sclerochoroidal calcification was established.

Conclusion: Sclerochoroidal calcifications may clinically and ultrasonographically mimic more serious intraocular lesions. B-scan ultrasonography and fluorescein angiography, play a key role in distinguishing these benign findings from other conditions. In asymptomatic patients without signs of progression, annual follow-up is recommended, with no need for therapeutic intervention.

Keywords: sclerochoroidal calcification, choroidal osteoma, fluorescein angiography, calcified intraocular lesions

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UVOD

Sklerohoroidalne kalcifikacije su retka, benigna očna stanja, koje karakteriše abnormalno taloženje kalcijuma i fosfata unutar beonjače i susedne horioideje. Ove promene se najčešće uočavaju kod starijih osoba i obično se otkriju slučajno tokom rutinskih oftalmoloških pregleda ili snimanja koje se vrši zbog drugih tegoba. Sklerohoroidalna kalcifikacija diferencijalno-dijagnostički može da podseća na prvom mestu na osteom sudovnjače, u retkim slučajevima na amelanotični melanom sudovnjače ili inflamatornu patologiju (fokalne hiorietinitise). Stoga je precizna dijagnoza od suštinskog značaja kako bi se izbegle nepotrebne intervencije [1,2].

Etiologija sklerohoroidalnih kalcifikacija može da bude idiopatska ili udružena sa sistemskim poremećajima metabolizma kalcijuma i fosfata, kao što su hiperparatiroidizam, hronična bubrežna bolest ili druge endokrine disfunkcije [3,4]. Klinički, ove lezije se manifestuju kao žućkaste, pločaste promene sa nejasnim granicama, najčešće lokalizovane između gornjih vaskularnih arkada. Često su obostrane i pokazuju visoku unutrašnju reflektivnost na ultrazvučnom B-skenu zbog prisustva kalcijuma, obično uz prisutno posteriorno akustično senčenje [5].

Ovaj prikaz slučaja opisuje pacijenta muškog pola kod koga je prethodno identifikovana stabilna subretinalna lezija na periferiji očnog dna levog oka. Kliničkim pregledom koji je obuhvatio oftalmoskopiju, ultrazvučnu dijagnostiku (B sken) i fluoresceinsku angiografiju (FA) uočena je lezija karakteristika sklerohoroidalne kalcifikacije. S obzirom na mogućnost da ovakve lezije oftalmoskopski mogu da liče pre svega na osteom sudovnjače, a daleko redje na amelanotični melanom sudovnjače, ovaj slučaj naglašava značaj detaljne kliničke procene u diferencijalnoj dijagnozi kalcifikovanih horoidalnih lezija.

PRIKAZ SLUČAJA

Pacijent muškog pola, star 62 godine, upućen je na Kliniku za očne bolesti Univerzitetskog Kliničkog centra Srbije radi procene tumorske lezije na periferiji levog očnog dna koja je prvobitno otkrivena u drugoj ustanovi 2019. godine tokom rutinskog oftalmološkog pregleda. Pacijent nije prijavio nikakve vidne smetnje, uključujući promene u ostrini vida, smetnje u vidnom polju ili pojavu fotopsija.

B-sken ultrazvuk levog oka (OS) pokazao je subretinalnu leziju lokalizovanu u gornjem delu očnog dna, spljoštenog izgleda, dimenzija baze 9,96 × 8,07 mm i prominencije od 1,05–1,54 mm. Lezija je pokazivala visoku unutrašnju reflektivnost i akustičnu senku, što ukazuje na gustu kalcifikaciju. Na osnovu ehografskih

INTRODUCTION

Sclerochoroidal calcifications are rare, benign ocular findings characterized by abnormal deposition of calcium and phosphate within the sclera and adjacent choroid. These lesions are most frequently observed in elderly individuals and are often identified incidentally during routine ophthalmic examinations or imaging performed for unrelated complaints. Although typically asymptomatic, their appearance may closely resemble more serious intraocular pathologies, including choroidal osteoma, amelanotic choroidal melanoma, metastatic tumors, or inflammatory granulomas. Therefore, accurate diagnosis is essential to prevent unnecessary interventions [1,2].

The etiology of sclerochoroidal calcifications can be idiopathic or associated with systemic abnormalities in calcium-phosphate metabolism, such as hyperparathyroidism, chronic kidney disease, or other endocrine disorders [3,4]. Clinically, these lesions present as yellowish, placoid areas with indistinct borders, most often located between the superior vascular arcades. They are frequently bilateral and demonstrate high internal reflectivity on B-scan ultrasonography due to calcium content, typically accompanied by posterior acoustic shadowing [5].

This case report describes a male patient with a previously identified, stable subretinal lesion in the peripheral retina of the left eye. Clinical evaluation, including ophthalmoscopy, B-scan ultrasonography, and fluorescein angiography (FA), revealed a lesion with features of sclerochoroidal calcification. Considering that such lesions may ophthalmoscopically resemble, most commonly, a choroidal osteoma and, much more rarely, an amelanotic choroidal melanoma, this case emphasizes the importance of detailed clinical assessment in the differential diagnosis of calcified choroidal lesions.

CASE REPORT

A 62-year-old male patient was referred to the Clinic for Eye Diseases, University Clinical Centre of Serbia, for evaluation of a tumorous lesion on the periphery of the left ocular fundus, which had been initially detected in another institution in 2019 during a routine ophthalmological examination. The patient reported no visual complaints, including changes in visual acuity, visual field disturbances, or photopsias.

B-scan ultrasonography of the left eye (OS) showed a subretinal lesion localized in the superior fundus, with a flattened appearance, measuring 9.96 × 8.07 mm in base and 1.05–1.54 mm in thickness. The lesion demonstrated high internal reflectivity and an acoustic shadow, indicating dense calcification. Based on

karakteristika, lezija je inicijalno smatrana osteomom sudovnjače.

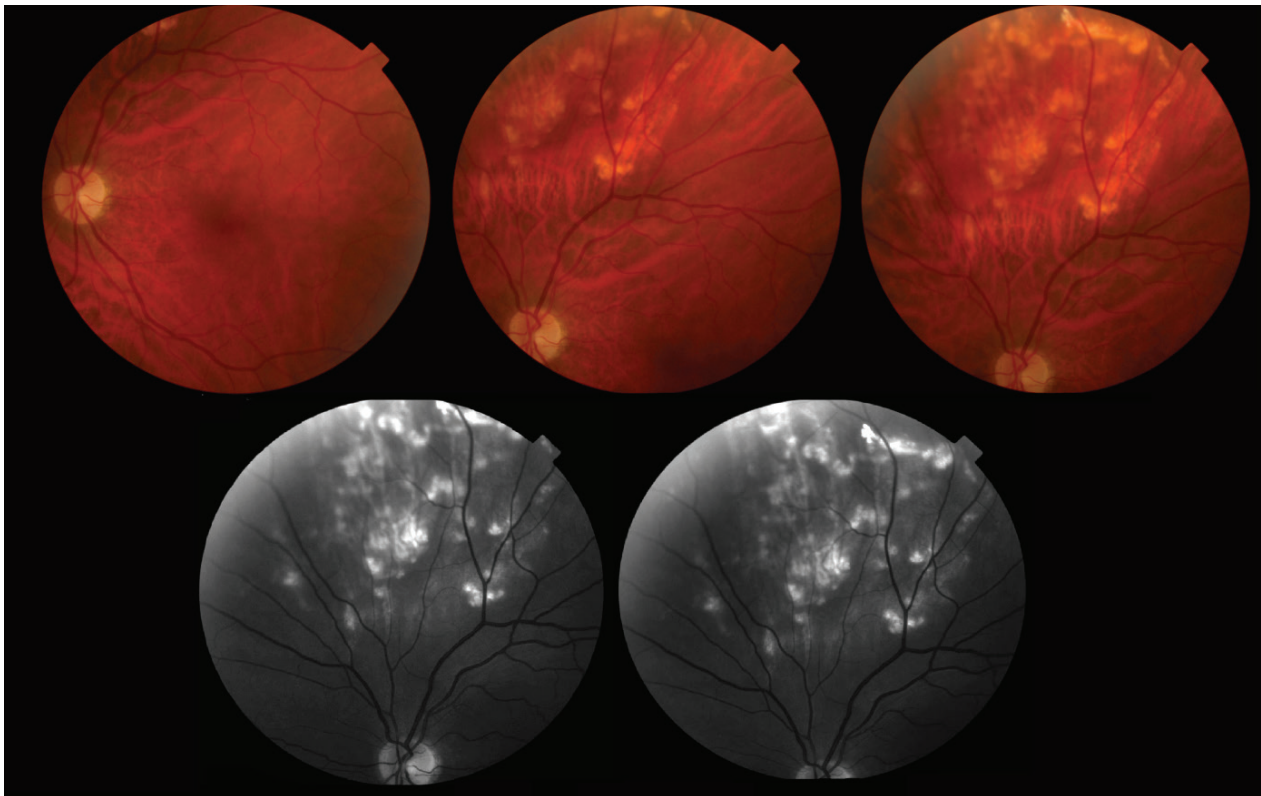
U oftalmološkoj anamnezi pacijent se leči od primarnog glaukoma otvorenog ugla zbog čega je na antiglaukomnoj terapiji u vidu kapi (Xalatan jednom dnevno). Nije bilo prethodne istorije povreda oka, upala ili hirurških intervencija. Od sistemskih bolesti, pacijent je imao hipertenziju i dijabetes melitus tip 2, koji su dobro regulisani. Takođe je zabeležena pozitivna porodična anamneza na glaukom.

Na pregledu, najbolja korigovana vidna oštrina iznosila je 0,8 na oba oka. Prednji segment oba oka bio je u granicama normale. Intraokularni pritisci bili su dobro kontrolisani uz postojeću antiglaukomsku terapiju (15 mmHg na desnom i 13 mmHg na levom oku). Oftalmološki pregled levog očnog dna otkrio je žućkastu subretinalnu leziju lokalizovanu suprapapilarno (Slika 1), između gornje-nazalne i gornje-temporalne vaskularne arkade. Lezija je imala nejasne granice i bila je blago izdignuta, bez pigmentacije ili eksudacije na njenoj površini. Okolna retina izgledala je normalno, a makula i papila vidnog živca nisu pokazivali patološke promene.

its echographic characteristics, the lesion was initially considered a choroidal osteoma.

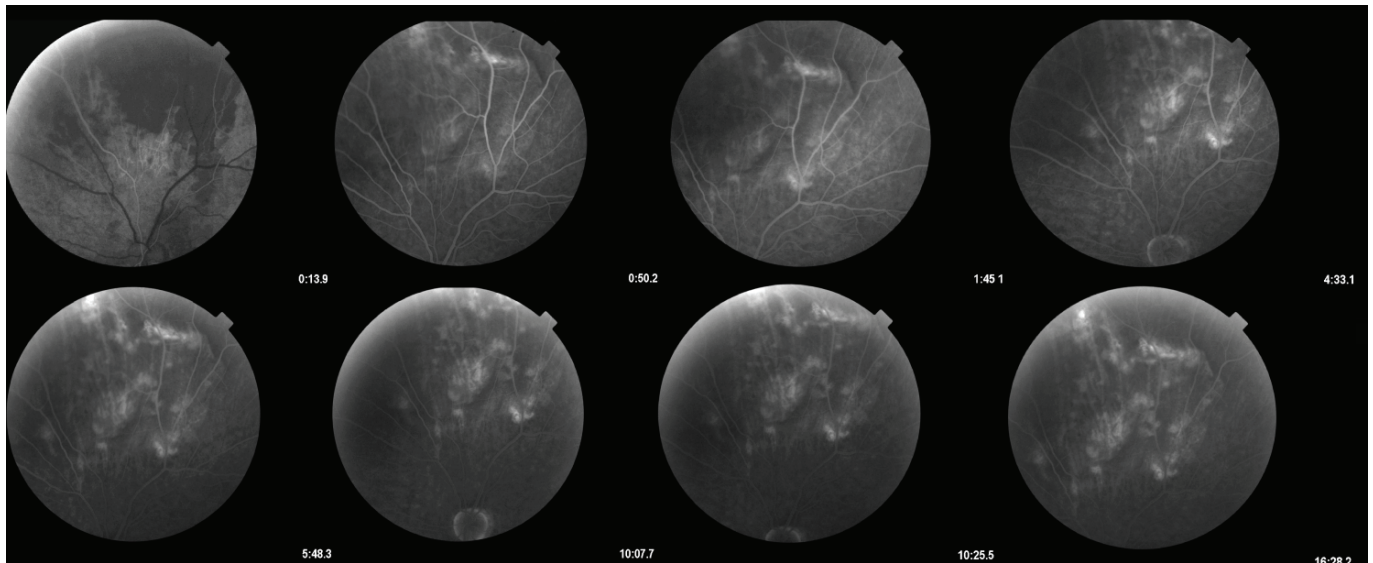
The patient's ophthalmological history included primary open-angle glaucoma diagnosed five years earlier, for which he was receiving topical antiglaucoma therapy (Xalatan once daily). There was no history of ocular trauma, inflammation, or surgery. His systemic medical history was notable for hypertension and type 2 diabetes mellitus, both well controlled under therapy. A positive family history of glaucoma was also noted.

On examination, best-corrected visual acuity was 0.8 in both eyes. The anterior segments were within normal limits. Intraocular pressures were well controlled under therapy (15 mmHg in the right eye and 13 mmHg in the left eye). Fundus examination of the left eye revealed a yellowish subretinal lesion located suprapapillary (Figure 1), between the superior-nasal and superior-temporal vascular arcades. The lesion had indistinct borders and was slightly elevated, without pigmentary changes or exudation on its surface. The surrounding retina appeared normal, and the macula and optic disc were unremarkable.



Slika 1. Fotografija očnog dna levog oka prikazuje žućkastu, pločastu subretinalnu leziju sa nejasnim granicama, lokalizovanu suprapapilarno, između gornje-nazalne i gornje-temporalne vaskularne arkade. Lezija odgovara sklerohoroidalnoj kalcifikaciji, deluje izdignuto, bez prisustva subretinalne tečnosti, krvarenja ili pigmentnih promena. Okolno retinalno tkivo, makula i papila vidnog živca izgledaju uredno

Figure 1. Fundus photograph of the left eye demonstrating a yellowish, placoid subretinal lesion with indistinct borders located suprapapillary, between the superior nasal and superior temporal vascular arcades. The lesion is consistent with sclerohoroidal calcification and appears elevated, without associated subretinal fluid, hemorrhage, or pigmentary changes. The surrounding retinal tissue, macula, and optic disc appear unremarkable



Slika 2. Fluoresceinska angiografija levog oka prikazuje hipofluorescentnu subretinalnu leziju lokalizovanu suprapapilarno, između gornjih vaskularnih arkada. Lezija ne pokazuje prisustvo curenja ili zadržavanja boje ni u ranim ni u kasnim fazama, što je u skladu sa benignim, avaskularnim procesom kao što je sklerohoroidalna kalcifikacija

Figure 2. Fluorescein angiography of the left eye showing a hypofluorescent subretinal lesion located suprapapillary, between the superior vascular arcades. The lesion demonstrates absence of leakage or staining in both early and late phases, consistent with a benign, avascular process such as sclerochoroidal calcification

Fluoresceinska angiografija (FA) prikazala je uglavnom hipofluorescentnu leziju u ranim fazama, bez značajnog curenja ili zadržavanja boje u kasnijim fazama (Slika 2). Na površini lezije uočene su žućkaste pločaste promene, bez prisustva subretinalne tečnosti ili horoidalne neovaskularizacije. Retinalni krvni sudovi i papila vidnog živca bili su uredni.

Na osnovu oftalmoskopskog pregleda i dodatnih snimanja (ultrazvuk oka (B sken) i fluoresceinska angiografija) utvrđeno je da lezija najviše odgovara sklerohoroidalnoj kalcifikaciji. Ipak, diferencijalna dijagnoza obuhvata na prvom mestu osteom sudovnjače, amelanotični melanom sudovnjače, hemangiom sudovnjače, metastatske lezije sudovnjače ili inflamatornu patologiju (fokalne hiororetinitise).

Pacijentu je preporučeno da nastavi sa redovnim oftalmološkim kontrolama na godišnjem nivou radi praćenja eventualnih promena u veličini lezije ili pojave komplikacija.

DISKUSIJA

Sklerohoroidalne kalcifikacije se često otkrivaju kao slučajni nalaz, ali mogu da predstavljaju dijagnostički izazov jer klinički mogu da liče na druge entitete kao što su osteom sudovnjače, amelanotični melanom sudovnjače, metastatske lezije sudovnjače, hemangiomi sudovnjače ili granulomatozne infiltracije povezane sa inflamatornim ili hematološkim oboljenjima [1,2]. Za preciznu dijagnozu neophodna je korelacija oftalmoskopskog, ultrazvučnog i angiografskog nalaza.

Fluorescein angiography (FA) showed a predominantly hypofluorescent lesion in the early phases, without significant leakage or staining in the later phases (Figure 2). Yellowish placoid changes were observed on the lesion surface, without subretinal fluid or choroidal neovascularization. The retinal vessels and optic disc were normal.

Based on ophthalmoscopy and additional imaging (B-scan ultrasonography and FA), the lesion was most consistent with sclerochoroidal calcification. However, the differential diagnosis included, primarily, choroidal osteoma, as well as amelanotic choroidal melanoma, choroidal hemangioma, metastatic lesions, and inflammatory pathology (focal chorioretinitis). The patient was advised to continue annual ophthalmological follow-up to monitor for potential changes in lesion size or the development of complications.

DISCUSSION

Sclerochoroidal calcifications are often discovered incidentally, but may represent a diagnostic challenge because their clinical appearance can mimic other entities such as choroidal osteoma, amelanotic choroidal melanoma, metastatic choroidal lesions, choroidal hemangiomas, or granulomatous infiltrates associated with inflammatory or hematologic diseases [1,2]. For an accurate diagnosis, correlation of ophthalmoscopic, ultrasonographic, and angiographic findings is required.

In our patient, the lesion was localized in the peripheral fundus and remained stable over time. On

Lezija kod našeg pacijenta bila je lokalizovana na periferiji očnog dna i ostala je stabilna tokom vremena. Na ultrazvuku je prisutna visoka unutrašnju reflektivnost uz prisustvo posteriorne akustične senke, što su karakteristike kalcifikovanih intraokularnih lezija [3]. Fluoresceinska angiografija prikazala je uniformno hipofluorescentan obrazac bez curenja ili zadržavanja boje, što ukazuje na ne-vaskularnu i benignu prirodu lezije [4]. Odsustvo prateće subretinalne tečnosti ili promena na pigmentnom epitelu retine dodatno smanjuje verovatnoću maligne ili inflamatorne etiologije.

U okviru diferencijalne dijagnoze, osteom sudovnjače je posebno važno razmotriti zbog sličnih karakteristika na snimanjima. Ipak, osteomi sudovnjače se obično javljaju kod mlađih osoba, najčešće su lokalizovani u peripapilarnom ili makularnom regionu, i mogu da budu praćeni oštećenjem vida, naročito kada su komplikovani horoidalnom neovaskularizacijom ili dekalifikacijom tumora [5]. Nasuprot tome, sklerohoroidalne kalcifikacije se češće javljaju kod starijih pacijenata, obično su periferno smeštene i retko utiču na oštrinu vida [6].

Udruženost sklerohoroidalne kalcifikacije sa sistemskim poremećajima metabolizma kao što su hiperparatiroidizam, hronična bubrežna bolest i drugi poremećaji koji utiču na ravnotežu kalcijuma i fosfata, je moguća pa je neophodno pacijenta ispitati i u pravcu tih oboljenja. Detaljna laboratorijska dijagnostika obuhvata određivanje ukupnog i jonizovanog kalcijuma, fosfata, paratiroidnog hormona (PTH), 25(OH) vitamina D, 1,25(OH)₂ vitamina D, kreatinina, uree, procene eGFR (izračunate na osnovu kreatinina), alkalne fosfataze, kao i osnovnih elektrolita – natrijuma, kalijuma, hlorida i magnezijuma [7,8]. Kod našeg pacijenta, sprovedena laboratorijska ispitivanja nisu ukazala na poremećaj u metabolizmu kalcijuma i fosfata, što ukazuje na primarni ili uzrastom uslovljen oblik bolesti.

S obzirom na njihov benigni tok, sklerohoroidalne kalcifikacije retko zahtevaju terapijsku intervenciju. Ipak, preporučuje se dugoročno praćenje kako bi se uočile eventualne morfološke promene. U ovom slučaju, odsustvo progresije i izostanak promena u vidu potvrdili su dijagnozu sklerohoroidalne kalcifikacije, a ne osteoma sudovnjače ili nekog drugog od već pomenutih diferencijalno-dijagnostičkih entiteta.

Sukob interesa: Nije prijavljen.

ultrasonography, it showed high internal reflectivity with posterior acoustic shadowing, features characteristic of calcified intraocular lesions [3]. Fluorescein angiography demonstrated a uniformly hypofluorescent pattern without leakage or staining, indicating the non-vascular and benign nature of the lesion [4]. The absence of subretinal fluid or retinal pigment epithelial changes further reduced the likelihood of malignancy or inflammation.

Within the differential diagnosis, choroidal osteoma is of primary importance due to overlapping imaging characteristics. However, choroidal osteomas typically occur in younger patients, are most often localized in the peripapillary or macular regions, and can be associated with visual impairment, particularly when complicated by choroidal neovascularization or tumor decalcification [5]. In contrast, sclerochoroidal calcifications usually appear in older patients, are often located peripherally, and rarely affect visual acuity [6].

Sclerochoroidal calcifications may be associated with systemic disorders of calcium-phosphate metabolism, including hyperparathyroidism, chronic kidney disease, and other metabolic disturbances. Therefore, systemic evaluation is mandatory. A detailed laboratory work-up should include measurement of total and ionized calcium, phosphates, parathyroid hormone (PTH), 25(OH) vitamin D, 1,25(OH)₂ vitamin D, creatinine, urea, estimated GFR (calculated from serum creatinine), alkaline phosphatase, and basic electrolytes such as sodium, potassium, chloride, and magnesium [7,8]. In our patient, laboratory testing revealed no abnormalities in calcium-phosphate metabolism, suggesting a primary or age-related form of the disease.

Given their benign course, sclerochoroidal calcifications rarely require therapeutic intervention. Nevertheless, long-term monitoring is recommended to detect potential morphological changes. In this case, the absence of progression and lack of visual symptoms confirmed the diagnosis of sclerochoroidal calcification rather than choroidal osteoma or any of the other aforementioned differential diagnoses.

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LITERATURA / REFERENCES

1. Gündüz AK, Tetik D. Diagnosis and management strategies in sclerochoroidal calcification: a systematic review. *Clin Ophthalmol*. 2023 Sep 11;17:2665-86. doi: 10.2147/OPTH.S399058.
2. Shields CL, Hasanreisoglu M, Saktanasate J, Shields PW, Seibel I, Shields JA. Sclerochoroidal calcification: clinical features, outcomes, and relationship with hypercalcemia and parathyroid adenoma in 179 eyes. *Retina*. 2015 Mar;35(3):547-54. doi: 10.1097/IAE.0000000000000450.
3. Honavar SG, Shields CL, Demirci H, Shields JA. Sclerochoroidal calcification: clinical manifestations and systemic associations. *Arch Ophthalmol*. 2001 Jun;119(6):833-40. doi: 10.1001/archopht.119.6.833.
4. Mani X, Johnson R. A case of sclerochoroidal calcification masquerading as a retained intraocular foreign body. *Radiol Case Rep*. 2023 Mar 25;18(5):2034-8. doi: 10.1016/j.radcr.2023.02.049.
5. Sood S, Friedman S. Sclerochoroidal calcification with optic nerve calcification in a patient with primary hyperparathyroidism and severe vision loss. *Retin Cases Brief Rep*. 2024 Jul 1;18(4):499-502. doi: 10.1097/ICB.0000000000001418.
6. Lopez JM, Rabinovich M, Colantuono D, Souied EH. Multimodal and retro-mode imaging in sclerochoroidal calcification: a case report. *Arch Soc Esp Oftalmol (Engl Ed)*. 2024 May;99(5):213-7. doi: 10.1016/j.oftale.2024.02.002.
7. Thomson AC, Brown GT, Dolores-Rodriguez A, Hunter AA. A Case of extensive bilateral idiopathic sclerochoroidal calcification and review of literature. *Int Med Case Rep J*. 2021 Oct 28;14:749-55. doi: 10.2147/IMCRJ.S336237.
8. Brahma VL, Shah SP, Chaudhry NA, Prenner JL. Bilateral idiopathic sclerochoroidal calcifications. *Open Ophthalmol J*. 2017 Apr 27;11:76-9. doi: 10.2174/1874364101711010076.

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Srpski medicinski časopis Lekarske komore objavljuje do sada neobjavljene originalne stručne i naučne radove, pregledne članke, kratka saopštenja, uvodnike, pisma uredniku, meta-analize, prikaze slučajeva, aktuelne teme, prikaze knjiga, radove iz istorije medicine i drugo, iz svih oblasti medicine, farmacije i stomatologije, čime doprinosi promociji i razvoju struke i nauke. Časopis se objavljuje u papirnom i elektronskom obliku četiri puta godišnje.

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Tekst rada treba da bude napisan latinicom u programu za obradu teksta *Word*, fontom *Times New Roman* i veličinom slova 12 tačaka (12 pt). Sve četiri margine treba podesiti na 25 mm, a veličinu stranice na format A4. Prored treba da bude 1,5, sa levim poravnanjem i uvlačenjem svakog pasusa za 10 mm. Ne treba da bude podeljenih reči (hifenacije). Ne treba koristiti tabulatore i uzastopne prazne karaktere (spejsove) radi poravnanja teksta, već alatke za kontrolu poravnanja u tulu. Za prelazak na novu stranu dokumenta koristi se isključivo *Page break*. Posle svakog znaka interpunkcije treba staviti samo jedan prazan karakter (spejs). Ako se u tekstu koriste specijalni znaci (simboli), koristite font iz paketa *Symbol*. Za nazive lekova koristiti isključivo generička imena. Uređaji (aparati) se označavaju fabričkim nazivima, a ime i mesto proizvođača treba navesti u obliku zagradama. Ukoliko se u tekstu koriste oznake koje su spoj slova i brojeva potrebno je precizno napisati broj koji se javlja u superskriptu ili supskriptu (na pr. 99Tc, IL-6, O₂, B12, CD8 itd.). Ukoliko se nešto uobičajeno piše kurzivom (*italic*) tako se i navodi (npr. nazivi gena). Neophodno je koristiti međunarodni sistem mernih jedinica (SI), uz izuzetak temperature (°C) i krvnog pritiska (mmHg). Ukoliko je rad deo magistarske teze, odnosno doktorske disertacije, ili je urađen u okviru naučnog projekta, to treba posebno naznačiti u Napomeni na kraju teksta.

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Delovi rada su: naslovna strana, sažetak sa ključnim rečima, tekst rada, zahvalnost (po želji), literatura i prilozi.

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The sections of the paper are: the cover page, the abstract and keywords, the text of the paper, acknowledgements (optional), literature, and attachments.

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ABSTRACT should be up to 250 words, including acronyms (third page). For original papers, preliminary and short communications, meta-analyses and review papers, the abstract should have the following structure: Introduction, Aim, Methods, Results, Conclusion. Each of these segments should be written as a separate paragraph. For case report, the summary should have the following sections: Introduction, Case Report, Conclusion; each part should be written as a separate paragraph. For other types of papers, the abstract does not have a special structure. List three to six key words or phrases below the abstract. Words from the

ba da se ponavljaju reči iz naslova, a ključne reči treba da budu relevantne i opisne. U izboru ključnih reči koristiti *Medical Subject Headings* – MeSH (<http://www.nlm.nih.gov/mesh>). Sažetak treba da bude napisan na srpskom i engleskom jeziku.

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STRUKTURA RADA. Svi podnaslovi se pišu velikim masnim slovima (**bold**). Originalni rad, meta-analiza, prethodno i kratko saopštenje obavezno treba da imaju sledeće podnaslove: Uvod (Cilj rada navesti kao poslednji pasus Uvoda), Metode rada, Rezultati, Diskusija (koncizna, jasna, predstavlja tumačenje i poređenje rezultata studije sa relevantnim studijama koje su objavljene u domaćoj i međunarodnoj literaturi), Zaključak (mora proisteci isključivo iz rezultata istraživanja rada, Spisak skraćenica (ukoliko su korišćene u tekstu), Zahvalnica, Literatura (navodi se arapskim brojevima redosledom kojim je u tekstu navedena u uglastim zagradama, vidi dalje). Struktura rada kod pregleda literature sastoji se od Uvoda, Većeg broja podnaslova, Zaključka, Literature. Autori preglednog rada treba da navedu bar tri rada (kao autori ili koautori) publikovanih u časopisima s recenzijom. Struktura rada kod prikaza jednog ili više slučajeva čine: Uvod (Cilj rada navesti kao poslednji pasus Uvoda), Prikaz bolesnika, Diskusija, Literatura. Ne treba koristiti imena bolesnika, inicijale, niti brojeve istorija bolesti, naročito u ilustracijama. Prikazi slučajeva ne smeju imati više od pet autora.

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Ukoliko je moguće, sve numeričke vrednosti zaokružiti na jedno decimalno mesto. Ne duplirati prikaz rezultata u tabelama i grafikonima. Za prikaz rezultata u tabelama i tekstu preporuka je da se: numerički podaci sa normalnom raspodelom i bez ekstremnih vrednosti prikazuju kao aritmetička sredina $\pm$ standardna devijacija; numerički podaci čija raspodela odstupa od normalnosti ili kada postoje ekstremne vrednosti, i ordinalni podaci prikazuju kao medijana i opseg (minimalna – maksimalna vrednost); nominalni podaci i ordinalni podaci sa malim brojem kategorija prikazuju kao n (%).

Prilikom opisa primenjenih statističkih metoda, prikaza i interpretacije rezultata u radu pridržavati se *SAMPL Guidelines* (Lang TA, Altman DG. *Basic statistical reporting for articles published in biomedical journals: the "Statistical Analyses and Methods in the Published Literature" or the SAMPL Guidelines*. *Int J Nurs Stud* 2015;52(1):5-9.). Primenjene statističke metode treba opisati dovoljno detaljno da ih čitalac može ponoviti na svojim podacima. Navesti korišćeni statistički test i nivo značajnosti. Saopštiti tačnu *p*-vrednost na 3 decimalna mesta.

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The number of pages provided for the appropriate structure of the paper is counted from the fifth page.

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(mol), a pritisak krvi u milimetrima živinog stuba (mm Hg). Sve rezultate hematoloških, kliničkih i biohemijskih merenja navoditi u metričkom sistemu prema Međunarodnom sistemu jedinica (SI).

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