ANAMU, MORINGA, SPIRULINA I HLORELA: DOPRINOS KVALITETU ŽIVOTA ONKOLOŠKIH PACIJENATA – REZULTATI POSTMARKETINŠKE PROSPEKTIVNE STUDIJE U SRBIJI, 2021 – 2022. GODINE

ORIGINALNI RAD

ORIGINAL ARTICLE

ANAMU, MORINGA, SPIRULINA, AND CHLORELLA: CONTRIBUTION TO THE QUALITY OF LIFE OF ONCOLOGY PATIENTS – RESULTS OF THE POST-MARKETING PROSPECTIVE STUDY PERFORMED IN SERBIA IN 2021 – 2022

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SAŽETAK

Uvod: Kvalitet života je jedan od prioritetnih ciljeva u lečenju onkoloških pacijenata. Pored konvencionalnih terapija, simptomatske terapije i terapije podrške su od značaja za krajnji ishod lečenja. Veliki broj ovakvih pacijenata koristi druge alternativne metode, kao što je biljna terapija.

Cilj: Ova prospektivna studija se bavi procenom uticaja biljaka: anamu, moringa, spirulina i hlorela, koje se rutinski koriste na Kubi, na kvalitet života onkoloških pacijenata.

Materijali i metode: Ispitano je 46 pacijenata sa različitim malignim tumorima u četvrtom stadijumu bolesti, od kojih je 26 bilo na hemioterapiji, a 18 na simptomatskoj i suportivnoj terapiji, a koji su oralno koristili ekstrakte navedenih biljaka, tokom tri meseca. Uz prethodno dobijenu saglasnost i ovlašćenje, korišćen je standardni *EORTC QLQ-C30* upitnik na maternjem jeziku pacijenata, za procenu kvaliteta života pre i posle tri meseca upotrebe.

Rezultati: Globalna procena opšteg zdravstvenog stanja i kvaliteta života pacijenata pokazala je značajno poboljšanje posle tri meseca korišćenja preparata, u odnosu na početak primene, prema ocenama pacijenata. Prema upitniku, na funkcionalnoj skali se poboljšalo svih pet parametara, ($p < 0,001$), a do poboljšanja je došlo i na skali simptoma (zamor, $p = 0,015$; bol, $p = 0,044$). Žene su postigle bolju fizičku funkcionalnost i značajniji gubitak zamora i bola, dok se kod muškaraca poboljšala kognitivna funkcionalnost. Emocionalna funkcionalnost se poboljšala u podgrupi pacijenata koji su primali hemioterapiju, dok su kod onih koji su je prethodno primili postojale značajne razlike u skoru skale simptoma gubitka apetita i konstipacije – simptoma koji su se povukli nakon tri meseca upotrebe proizvoda, izjednačavajući podgrupe po pitanju smanjenja ovih simptoma. Kod ostalih funkcionalnih parametara su takođe dobijene statistički značajne razlike za sve pacijente.

Zaključak: Poboljšanje kvaliteta života i funkcionalnosti kao i smanjenje bola i zamora pacijenata postignuto je kod svih ispitanika i bilo je statistički značajno, bez obzira da li su primali hemioterapiju ili ne tokom korišćenja biljnih preparata.

Ključne reči: maligni tumori, kvalitet života, anamu, hlorela, moringa, spirulina

ABSTRACT

Introduction: The quality of life is one of the priority goals in the treatment of oncology patients. In addition to conventional therapies, symptomatic and supportive treatments are valuable for the final treatment outcome. Many such patients resort to alternative methods, such as herbal therapy.

Study aim: This prospective study aimed to assess the effect of the plants: anamu, moringa, spirulina, and chlorella, which are routinely used in Cuba, on the quality of life of oncology patients.

Materials and methods: Forty-six patients with various stage four malignant tumors were examined. Of the 46 patients, 26 were on chemotherapy, while 18 were on symptomatic and supportive therapy. The patients used extracts of the aforementioned plants orally, for three months. With prior consent and authorization, the standard EORTC QLQ-C30 questionnaire, written in the patients' native language, was used to assess quality of life, before and after three months of use.

Results: According to patient ratings, overall assessment of patient general health status and quality of life showed significant improvement after three months of use of the extracts, as compared to the beginning of application. According to the questionnaire, all five parameters improved on the functional scale, ($p < 0.001$), and the scores on the symptoms scale also improved (fatigue, $p = 0.015$; pain, $p = 0$,044). Women achieved better physical functionality and significant loss of fatigue and pain, while cognitive functionality improved in men. Emotional functionality improved in the subgroup of patients who were receiving chemotherapy, while in those who had previously received chemotherapy, there were significant differences in the symptoms scale score regarding loss of appetite and constipation – symptoms that resolved after three months of product use, thus equating the subgroups in terms of the reduction of these symptoms. In other functional parameters, statistically significant differences were also obtained for all patients.

Conclusion: The improvement in the quality of life and functionality of patients, as well as the reduction in symptoms, whether the patients received chemotherapy or not, was statistically significant.

Keywords: malignant tumors, quality of life, anamu, chlorella, moringa, spirulina

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UVOD

Biljna medicina (fitoterapija) je najstariji oblik lečenja koji koristi biljke i biljne derivate zbog njihovih lekovitih svojstava [1].

Upotreba biljaka je bila osnova za razvoj savremene medicine, a u nekim ruralnim i autohtonim sredinama predstavljaju jedino raspoloživo sredstvo lečenja, zbog nedostatka medicinskih objekata i sredstava za primenu savremene medicine. U mnogim zajednicama, narodna medicina još nije nestala. Pored biljnih vrsta koje uspevaju na određenim staništima, danas postoje mogućnosti korišćenja biljnih vrsta koje ne rastu na našem području. Zbog toga imamo koristi od upotrebe lekovitog bilja, ne samo za lečenje bolesti, već i za prevenciju bolesti i za njihovo korišćenje u ishrani [2].

Devedesetih godina prošlog veka, profesor Rozenberg, sa Odeljenja za javno zdravlje Medicinskog fakulteta Univerziteta Harvard, navodeći značaj integrativne medicine, objavio je dva izveštaja koja pokazuju da 45% američkih pacijenata, nakon posete svom lekaru, traži pomoć od stručnjaka u oblasti takozvane „alternativne medicine" [3], kao pristupu komplementarnom zvaničnoj medicini.

Integrativna medicina predstavlja medicinsku doktrinu zasnovanu na Hipokratovoj viziji „umetnosti lečenja", kojom se ističe važnost lečenja celog pacijenta, odnosno holistički pristup osobi sa zdravstvenim problemima [4,5]. Integrativni model kombinuje znanja zapadne, naučno-tehnološke medicine (zasnovane na naučnim dokazima), sa određenim terapijskim sredstvima takozvane komplementarne medicine, gde spada i stručno indikovana upotreba lekovitog bilja, fitoterapija.

Integrativna medicina je takođe veoma korisna u lečenju malignih bolesti, kada u isto vreme želimo da sačuvamo kvalitet života pacijenta. Takođe, primenom principa integrativne medicine, naglašava se fundamentalna uloga adekvatne ishrane za poboljšanje opšteg stanja pacijenata, a koja podrazumeva individualni program ishrane prilagođen njihovoj bolesti [9].

Iako do sada nema dovoljno dokaza o delotvornosti fitoterapije kao terapije izbora u lečenju malignitеta, postoje indicije da može da poboljša kvalitet života. Fitoterapija može da pomogne obolelima od malignih bolesti u podnošenju neželjenih efekata terapije, kao i nekih simptoma malignih bolesti. Na primer, korišćenje prirodnih komponenti biljaka u terapijskim koncentracijama, dodavanjem ortomolekularne suplementacije, može pomoći i smanjenju unosa tradicionalnih lekova (analgetici, antiinflamatorni lekovi, anksiolitici, i dr.) [6–8].

Na Kubi, prirodna medicina koristi fitoterapiju kao dopunu konvencionalnoj terapiji u lečenju hroničnih

INTRODUCTION

Herbal medicine (phytotherapy) is the oldest form of treatment that uses plants and plant derivatives due to their medicinal properties [1].

The use of plants was the basis for the development of modern medicine, and in some rural and indigenous areas, they represent the only available means of treatment, due to the lack of medical facilities and resources for the application of modern medicine. In many communities, folk medicine has not yet disappeared. In addition to plant species that thrive in certain habitats, today there are opportunities to use plant species that do not grow in the area we live in. Therefore, we benefit from the use of medicinal plants (i.e., medicinal herbs), not only in the treatment of diseases, but also in the prevention of diseases and in nutrition [2].

In the 1990s, Professor Rosenberg, from the Department of Public Health at Harvard Medical School, citing the importance of integrative medicine, published two reports showing that 45% of American patients, after visiting their doctor, seek help from professionals in the field of what is often referred to as 'alternative medicine' [3], as an approach that is complementary to official medicine.

Integrative medicine represents a medical doctrine based on Hippocrates' vision of the 'art of healing', which emphasizes the importance of treating the whole patient, i.e., applying a holistic approach to a person with health problems [4,5]. The integrative model combines the knowledge of Western, science and technology based medicine (founded on scientific evidence), with certain therapeutic resources of what is known as 'complementary medicine', which includes the use of medicinal plants, as indicated by a professional, i.e., phytotherapy.

Integrative medicine is also very useful in the treatment of malignant diseases, when, at the same time, we want to preserve the patient's quality of life. Also, by applying the principles of integrative medicine, the fundamental role of appropriate nutrition in improving the general health status of patients is emphasized, which implies the creation of an individual nutrition program tailored to the patient's disease [9].

Although, thus far, there is not enough evidence on the effectiveness of phytotherapy as the therapy of choice in the treatment of malignancies, there are indications that it can improve the quality of life. Phytotherapy can help patients with malignant diseases to cope with the side effects of therapy, as well as with some symptoms of malignant diseases. For example, the use of natural plant components in therapeutic concentrations, by adding orthomolecular supplementation, can help reduce the intake of traditional

bolesti kao što su maligna oboljenja. Fitoterapija, kao deo medicinske prakse, služi se profesionalnim iskustvom za ublažavanje simptoma bolesti i toksičnosti konvencionalnih terapija. U personalizovanom pristupu lečenju pacijenata sa malignim tumorima, standardna medicinska praksa, uz suportivnu terapiju, dovodi do poboljšanja kvaliteta života pacijenata, kao i povećanja šansi za izlečenje [10].

Fitoterapija, kao jedna od alternativnih terapija, pomaže u poboljšanju funkcije imunološkog sistema pacijenta, smanjujući oksidativni stres, čime se usporava napredovanje bolesti, poboljšava nutritivni status, i postiže bolja tolerancija na konvencionalne terapije [11].

Među biljkama koje se na Kubi najviše koriste za alternativno lečenje karcinoma, i koje su detaljnije proučavane, izdvajaju se anamu, moringa, spirulina i hlorela.

Anamu

Anamu ili *Petiveria alliacea* L. (*Phytolaccaceae*) je autohtona biljka amazonske džungle, a takođe može da raste u oblastima kao što su tropska i Centralna Amerika, Karibi i jugoistočni deo Sjedinjenih Američkih Država. Predstavlja jednu od biljaka sa najvećim farmakološkim potencijalom u svetu, o čemu svedoči i podatak da je na Univerzitetu Ilinois izabrana, među 14.000 biljnih ekstrakata, kao jedan od 34 kandidata sa antitumorskim potencijalom. Zahvaljujući brojnim lekovitim svojstvima, detaljno ga je proučavala *Farmaceutska laboratorija* na Kubi, gde je objašnjeno da lekovite biljke sa terapijskim imunostimulativnim dejstvom nisu uobičajene u biljnom carstvu. Anamu raste u izobilju, kako u pustinji, tako i u kultivisanim područjima Kube. Ima dokazane efekte u podsticaju odgovora ćelija imunog sistema, što je opravdalo proizvodnju tableta, i njegovu registraciju kao biljnog imunostimulansa, u skladu sa zahtevima kubanskih regulatornih organa za ljudsku upotrebu lekova. Pomenute tablete sadrže dozu u prahu iz listova i stabljika [10].

Prema istraživanju koje je na Kubi sproveo naučni tim na čelu sa dr Zoe Lemus Rodrigez, anamu (cela biljka) sadrži brojne aktivne supstance, među kojima su: alkaloidi (alantoin, N-metil-4-trans metoksi prolin); steroidi (beta-sitosterol); triterpeni (izobornil, izobornil acetat, izobornil cinamat, alfa-fridelinol); derivati sumpora (benzil-2-hidroksi-5-etil-trisulfid, dibenzil trisulfid); flavonoidi (astilbin, želatin, leridal, leridol, leridol-5-metil-etar, miricitrin); neorganska jedinjenja (kalijum nitrat); lipidi (lignocerinska kiselina, lignoceril lignocerat, linolna kiselina, neadekanska kiselina, oleinska kiselina, palmitinska kiselina, stearinska kiselina); derivati benzena (benzaldehid, benzojeva kiselina); alkani (lignoceril alkohol); ugljeni hidrati (pinitol). Konkretno, svoj-

drugs (analgesics, anti-inflammatory drugs, anti-anxiety drugs, etc.) [6–8].

In Cuba, natural medicine uses phytotherapy as supplementary to conventional therapy in the treatment of chronic diseases, such as malignant diseases. Phytotherapy, as part of medical practice, uses professional experience to alleviate the symptoms of disease and the toxicity of conventional therapies. In a personalized approach to the treatment of patients with malignant tumors, standard medical practice, along with supportive therapy, leads to an improvement in the quality of life of patients, as well as an increase in the chances of recovery [10].

Phytotherapy, as a form of alternative therapy, helps to improve the function of the patient's immune system by reducing oxidative stress, which slows down the progression of the disease, improves nutritional status, and promotes better tolerance to conventional therapies [11].

Among the plants that are used the most in Cuba for alternative cancer treatment, and which have been studied more closely, anamu, moringa, spirulina and chlorella stand out.

Anamu

Anamu or *Petiveria alliacea* L. (*Phytolaccaceae*) is an indigenous plant of the Amazon jungle and can also grow in areas such as tropical and Central America, the Caribbean and the southeastern part of the United States of America. It represents one of the plants with the greatest pharmacological potential in the world, as demonstrated by the fact that it was selected, at the University of Illinois, among 14,000 plant extracts, as one of 34 candidates with antitumor potential.Due to its numerous medicinal properties, it was studied in detail by the *Pharmaceutical Laboratory* in Cuba, where it was clarified that medicinal plants with therapeutic immunostimulating effects are not common in the plant kingdom. Anamu grows in abundance, both in the desert and in the cultivated areas of Cuba. It has proven effects in stimulating immune system cell response, which has justified the production of tablets made from the plant, and the registration of this supplement as a herbal immunostimulant, in accordance with the requirements of the Cuban regulatory authorities for the human use of drugs. The above-mentioned tablets contain a dose of powder made from the leaves and stems of the plant [10].

According to research conducted in Cuba by a team of scientists led by Dr. Zoe Lemus Rodríguez, anamu (the whole plant) contains numerous active ingredients, including the following: alkaloids (allantoin, N-methyl-4-trans methoxy proline); steroids (beta-sitosterol);

stva kao što je imunostimulacija pripisuju se taninima, polifenolima i benzil-2-hidroksi-5-cetil-trisulfidu, koji se nalaze u listovima i mladim stabljikama biljke [10,11].

U Nacionalnom centru za naučna istraživanja Kube je sprovedeno istraživanje sa biljnim ekstraktima anamua, koje je otkrilo postojanje elemenata kao što su selen (Se), cink (Zn), bakar (Cu), gvožđe (Fe) i magnezijum (Mg), koji utiču na imuni sistem [10].

Jovićević je, 1993. godine, pokazao inhibitorno dejstvo anamua na proliferaciju tumora, posebno u ćelijskim linijama leukemije, bez ugrožavanja zdravog tkiva [12].

Marini i saradnici su opisali efekat biljnih ekstrakata anamua na proizvodnju citokina, kao što su interleukin-2 i interleukin-4, kao i na povećanje citotoksične aktivnosti ćelija prirodnih ubica (engl. *natural killer cells – NK cells*) [13].

Godine 1997, Vilijams je izvestio da je anamu povećao aktivnost timusa i belih krvnih zrnaca. Drugi autori su istakli da je imunomodulatorno dejstvo posledica značajnog povećanja fagocitnog indeksa granulocita kod ljudi [14].

Nedavno je test sa vodenim ekstraktom ove biljke potvrdio da ona stimuliše proizvodnju limfocita i interleukina-2 kod pacova. Godinu dana kasnije, u eksperimentu sa miševima, pokazalo se da ekstrakt anamua povećava aktivnost *NK* limfocita za 100%, te da stimuliše proizvodnju interferona, interleukina-2 i interleukina-4 [14–16].

Najnovija saznanja o delovanju inhibitora tirozin kinaze i molekularnih meta u onkologiji su trenutno povezana sa ispitivanjem mogućnosti dobijanja antitumorskog farmakološkog sredstva iz ove biljke [17].

Moringa

Moringa (*Moringa oleifera*) je zimzeleno drvo i najpoznatija i najrasprostranjenija vrsta u porodici *Moringaceae*. Listovi moringe sadrže b-karoten, vitamin C, flavonoide, fenolna jedinjenja, masne kiseline, kao što su omega-3 i omega-6 masne kiseline, kao i kalcijum i kalijum. Njeno seme ima visok sadržaj ugljenih hidrata, lipida i proteina, koji čine od 33 % do 60% njene suve materije. Ova vrsta se široko koristi zbog svojih preventivnih svojstava kod hroničnih bolesti (uključujući antispazmodična, antidiuretička, antihipertenzivna, antiulkusna, antikancerogena, antidijabetička, antimikrobna, te antihiperholesterolska svojstva) [18–22].

Proteinski izolati iz ove biljke se koriste kao dodaci ishrani i imaju potencijal da generišu bioaktivne peptide *in vitro* proteolizom ili varenjem. Peptidi se mogu proizvesti prirodnim putem gastrointestinalnim procesom varenja, ali se takođe mogu dobiti *in vitro*, korišćenjem proteolitičkih enzima. Biofunkcionalna

triterpenes (isobornyl, isobornyl acetate, isobornyl cinnamate, alpha-friedelinol); sulfur derivatives (benzyl-2-hydroxy-5-ethyl-trisulfide, dibenzyl trisulfide); flavonoids (astilbin, gelatin, leridal, leridol, leridol-5-methyl-ether, myricitrin); inorganic compounds (potassium nitrate); lipids (lignoceric acid, lignoceryl lignocerate, linoleic acid, nonadecanoic acid, oleic acid, palmitic acid, stearic acid); benzene derivatives (benzaldehyde, benzoic acid); alkanes (lignoceryl alcohol); carbohydrates (pinitol). In particular, properties such as immunostimulation are attributed to tannins, polyphenols and benzyl-2-hydroxy-5-cetyl-trisulfide, which are found in the leaves and young stems of the plant [10,11].

At the National Center for Scientific Research of Cuba, a study was conducted on anamu plant extracts which revealed the presence of elements such as selenium (Se), zinc (Zn), copper (Cu), iron (Fe) and magnesium (Mg), which affect the immune system [10].

In 1993, Jovićević demonstrated the inhibitory effect of anamu on tumor proliferation, especially in leukemia cell lines, without endangering healthy tissue [12].

Marini et al. described the effect of anamu plant extracts on the production of cytokines, such as interleukin-2 and interleukin-4, as well as on increasing the cytotoxic activity of natural killer cells (NK cells) [13].

In 1997, Williams reported that anamu increased the activity of the thymus and white blood cells. Other authors pointed out that the immunomodulatory effect is due to a significant increase in the phagocytic index of granulocytes in humans [14].

Recently, a test with an aqueous extract of this plant confirmed that it stimulates the production of lymphocytes and interleukin-2 in rats. A year later, in an experiment with mice, it was shown that the extract of anamu increases the activity of NK lymphocytes by 100%, and that it stimulates the production of interferon, interleukin-2 and interleukin-4 [14-16].

The latest findings on the action of tyrosine kinase inhibitors and molecular targets in oncology are currently linked to the investigation of the possibility of obtaining an antitumor pharmacological agent from this plant [17].

Moringa

Moringa (*Moringa oleifera*) is an evergreen tree and the best known and most widespread species in the *Moringaceae* family. Moringa leaves contain b-carotene, vitamin C, flavonoids, phenolic compounds, fatty acids, such as omega-3 and omega-6 fatty acids, as well as calcium and potassium. Its seeds have a high content of carbohydrates, lipids and proteins, which make up from 33% to 60% of its dry matter. This species is widely used for its preventive properties in chronic diseases (including

svojstva ovih peptida su povezana sa regulatornim funkcijama u kardiovaskularnom, digestivnom, imunološkom i nervnom sistemu, u zavisnosti od sastava i strukture aminokiselina. Moringina nutritivna svojstva uključuju antioksidativnu aktivnost u suzbijanju peroksidacije lipida, antihipertenzivnu funkciju povezanu sa inhibicijom angiotenzin-konvertujućeg enzima (engl. *angiotensin-converting enzyme – ACE*), antidijabetička svojstva povezana sa aktivnošću amilaze, antiinflamatorna svojstva, kao i funkciju usporavanja starenja ćelija, antimikrobna svojstva, i druge [23–27].

Moringa oleifera sadrži značajnu količinu važnih fitohemikalija, kao što su fenoli, flavonoidi, alkaloidi, vitamini, glikozidi, steroli, minerali i aminokiseline, u semenu, listu i plodu. Pokazalo se da seme moringe ima diuretička, kao i antitumorska i antimikrobna svojstva. Godine 2005, objavljena je studija koja je pružila informacije o citotoksičnom efektu etanolnog ekstrakta korena biljke *Moringa oleifera* na ćelijske linije leukemije i melanoma. *MCF7* je estrogen pozitivna ćelijska linija karcinoma dojke koja se obično koristi kao *in vitro* model u terapijskim istraživanjima karcinoma dojke [18,28–32].

Seme moringe sadrži dimerne katjonske proteine (13-*kDa*) tako da ima koagulantna i antimikrobna svojstva, i može se koristi za dekontaminaciju i tretman zamućene vode. Seme moringe sadrži 19% – 47% esencijalnih ulja koja predstavljaju odličan dodatak ishrani. Ulje semena se koristi ne samo kao biljno ulje za kuvanje, otporno na oksidativnu degradaciju, već i za lečenje raznih nutritivnih intoksikacija [18,33].

Spirulina i hlorela

Spirulina platensis (*Sp*) je spiralna filamentozna alga iz porodice višećelijskih i fotosintetskih cijanobakterija (plavo-zelene alge) koja pripada klasi *Cyanophyceae*, familiji *Oscillatoriaceae*. Ova cijanobakterija se uzgaja širom sveta i koristi se kao primarni dodatak ishrani. Sadrži široki spektar profilaktičkih i lekovitih hranljivih materija – vitamine, minerale, proteine, linolnu kiselinu, b-karoten, kao i neistražena bioaktivna jedinjenja. Pored nutritivnih prednosti, spirulina ima i druga svojstva, kao što su antibakterijska, antifungalna, antivirusna, antikancerogena, antiinflamatorna i antioksidativna svojstva, a koristi se i kao dodatak ishrani u akvakulturi i uzgoju živine [34].

Chlorella vulgaris (*Cv*) je slatkovodna, zelena, jednoćelijska mikroalga, koja pripada tipu *Phylum Chlorophyta* i širom sveta je priznata kao funkcionalni prehrambeni proizvod. Bogata je proteinima, lipidima, karotenoidima, vitaminima i mineralima i smatra se vrednim izvorom proteina među potencijalnim izvorima hrane. Sadrži i omega-3 i omega-6 masne kiseline, ugljene hidrate, celulozu, esencijalne aminokiseline, antispasmodic, antidiuretic, antihypertensive, antiulcer, anticancerogenic, antidiabetic, antimicrobial, and antihypercholesterolemic properties) [18–22].

Protein isolates from this plant are used as food supplements and have the potential to generate bioactive peptides in vitro, by proteolysis or digestion. Peptides can be produced naturally by the gastrointestinal digestion process, but they can also be obtained in vitro, using proteolytic enzymes. The biofunctional properties of these peptides are related to regulatory functions in the cardiovascular, digestive, immune and nervous systems, depending on the composition and structure of amino acids. Moringa's nutritional properties include antioxidant activity in the suppression of lipid peroxidation, antihypertensive function associated with the inhibition of angiotensin-converting enzyme (ACE), antidiabetic properties associated with amylase activity, anti-inflammatory properties, as well as the function of slowing cell aging, antimicrobial properties, and other [23–27].

Moringa oleifera contains a significant quantity of important phytochemicals, such as phenols, flavonoids, alkaloids, vitamins, glycosides, sterols, minerals and amino acids, in its seeds, leaves and fruit. Moringa seeds have been shown to have diuretic as well as antitumorous and antimicrobial properties. In 2005, a study was published that provided information on the cytotoxic effect of the ethanolic root extract of the *Moringa oleifera* plant on leukemia and melanoma cell lines. MCF7 is an estrogen-positive breast cancer cell line commonly used as an in vitro model in breast cancer therapeutic research [18,28–32].

Moringa seeds contain dimeric cationic proteins (13-kDa), which is why they have coagulant and antimicrobial properties, and can be used for decontamination and treatment of turbid water. Moringa seeds contain 19% - 47% of essential oils, which are an excellent nutritional supplement. The seed oil is used not only as a vegetable oil for cooking, resistant to oxidative degradation, but also for the treatment of various nutritional intoxications [18,33].

Spirulina and chlorella

Spirulina platensis (*Sp*) is a spiral-filamentous alga from the family of multicellular and photosynthetic cyanobacteria (blue-green algae) belonging to the class *Cyanophyceae*, the family *Oscillatoriaceae*. This cyanobacterium is cultivated worldwide and used as a primary dietary supplement. It contains a wide range of prophylactic and healing nutrients – vitamins, minerals, proteins, linoleic acid, b-carotene, as well as unexplored bioactive compounds. In addition to nutritional benefits, spirulina has other properties, such as anti-

karotene i vitamin A. Pored toga, hlorela se koristi kao proteinsko sredstvo za ljudsku upotrebu i kao alternativni antibiotik u stočarskoj proizvodnji. Potvrđeno je da hlorela takođe ima imunomodulatornu aktivnost kod pilića, poboljšavajući performanse rasta i kvalitet kokošijih jaja [35].

Spirulina platensis, među svojim aktivnim sastojcima sadrži minerale, vitamine, esencijalne aminokiseline i proteine, kao i beta-karoten, tokoferole i fenolne kiseline, koji pokazuju visok nivo antiinflamatornih i antioksidativnih svojstava. Iz tog razloga se koristi kao dopuna ljudskoj ishrani, kao i u ishrani mnogih životinjskih vrsta, poput ptica i riba. Pored toga, *Spirulina platensis* sadrži i visoko aktivni sastojak, c-fikocijanin, koji ispoljava antiinflamatorno, imunomodulatorno, hepatoprotektivno, nefroprotektivno, neuroprotektivno, antidijabetičko, antigenotoksično, antihipertenzivno i antikancerogeno dejstvo [34].

Spirulina je takođe bogata tetrapirolima, direktno povezanim sa molekulom bilirubina, moćnim antioksidansom i antiproliferativnim agensom. Potencijalni antikancerogeni efekti tetrapirola dobijenog iz *S. platensis* se istražuju kod karcinoma pankreasa. Antiproliferativni efekti *S. platensis* i njenih tetrapirol komponenti (fikocijanin (PCB) i hlorofilin, molekul koji je zamena za hlorofil A) pokazali su određenu aktivnost u ćelijskim linijama karcinoma pankreasa kod ljudi i golih miševa sa ksenotransplantiranim ćelijama [34].

Komplementarna i alternativna medicina su priznate metode lečenja u mnogim zemljama. Ove metode lečenja uključuju fitoterapiju, koja je obično zastupljena sa nekih 50% [41]. U periodu od 1940. do 2014. godine, više od polovine lekova protiv karcinoma koji su ušli u rutinsku upotrebu, dobijeni su iz biljaka [39,42]. Prema istraživanjima trendova, više od 65% – 75% pacijenata sa malignim bolestima je koristilo neku vrstu komplementarne medicine [38], a prema podacima Svetske zdravstvene organizacije, ovaj broj dostiže i 80% [39]. Pacijentima ovu formu terapije predlažu članovi porodice, prijatelji ili joj pribegavaju na preporuku nekoga ko se već leči od maligniteta.

U Srbiji je primena fitoterapije i dalje skromno zastupljena. Domaći autori su pokazali da skoro trećina pacijenata veruje da ovim metodama može da izleči svoju bolest, dok većina očekuje da će bolje rezultate lečenja postići konvencionalnim metodama nego alternativnim [40].

CILJ ISTRAŽIVANJA

Cilj istraživanja je bio da se proceni uticaj primene ekstrakata biljaka sa Kube – anamu, moringa, spirulina i hlorela, kao dodataka ishrani, na kvalitet života onkoloških pacijenata, tokom i posle primene onkološke terapije.

bacterial, antifungal, antiviral, anticancerous, anti-inflammatory and antioxidant properties, and is also used as a nutritional supplement in aquaculture and poultry farming [34].

Chlorella vulgaris (*Cv*) is a freshwater, green, unicellular microalga, belonging to the phylum *Chlorophyta* and recognized worldwide as a functional food product. It is rich in proteins, lipids, carotenoids, vitamins and minerals and is considered a valuable source of protein among potential food sources. It contains both omega-3 and omega-6 fatty acids, carbohydrates, cellulose, essential amino acids, carotenes and vitamin A. In addition, chlorella is used as a protein supplement for human consumption and as an alternative antibiotic in livestock production. Chlorella has also been confirmed to have immunomodulatory activity in chickens, improving growth performance and egg quality [35].

Among its active ingredients, *Spirulina platensis* contains minerals, vitamins, essential amino acids and proteins, as well as beta-carotene, tocopherols and phenolic acids, which have shown a high level of anti-inflammatory and antioxidant properties. This is why it is used as a supplement in human nutrition, as well as in the nutrition of many animal species, such as birds and fish. In addition, *Spirulina platensis* also contains a highly active ingredient, c-phycocyanin, which exhibits anti-inflammatory, immunomodulatory, hepatoprotective, nephroprotective, neuroprotective, antidiabetic, antigenotoxic, antihypertensive and anticancerous effects [34].

Spirulina is also rich in tetrapyrroles, which are directly linked to the bilirubin molecule, a powerful antioxidant and antiproliferative agent. The potential anticancerous effects of tetrapyrrole obtained from *S. platensis* are being investigated in pancreatic cancer. The antiproliferative effects of *S. platensis* and its tetrapyrrole components (phycocyanin (PCB) and chlorophyllin, a molecule that is a substitute for chlorophyll A) showed some activity in human pancreatic cancer cell lines and in nude mice with xenotransplanted cells [34].

Complementary and alternative medicine are recognized treatment methods in many countries. These treatment methods include phytotherapy, which usually accounts for around 50% [41]. In the period between 1940 and 2014, more than half of the anticancer drugs that entered routine use were obtained from plants [39,42]. According to trend research, more than 65% – 75% of patients with malignant diseases used some kind of complementary medicine [38], and according to World Health Organization data, this number is as high as 80% [39]. This is suggested to patients by family members, friends or someone who is already being treated for a malignancy.

MATERIJALI I METODE

U postmarketinšku prospektivnu nerandomizovanu studiju je uključeno 46 pacijenata. Ukjučeni su pacijenti koji su pre korišćenja biljnih preparata pristali da popune i upitnik o kvalitetu života. Ekstrakti su prethodno registrovani u Srbiji, kao dodatak ishrani, a pacijenti su ih dobili kao donaciju od kubanskih lekara. U studiju su uključeni pacijenti oboleli od različitih malignih tumora (devet pacijenata sa karcinomom dojke, sedam sa karcinomom pluća, šest sa karcinomom debelog creva, pet sa karcinomom prostate, četiri sa karcinomima glave i vrata, tri sa limfomima, dva sa karcinomom grlića materice i jedan sa karcinomom ovarijuma, po dva sa karcinomom želuca, karcinomom urotrakta, karcinomom mozga i sarkomom mekih tkiva, te jedan sa karcinomom pankreasa). Od toga je bilo 20 muškaraca i 26 žena, starosti od 30 do 87 godina, sa prosečnom starošću od 60 godina. Pacijenti su bili na redovnom onkološkom praćenju, na tri meseca, kod svog ordinirajućeg onkologa, u različitim onkološkim ustanovama Srbije.

Bilo je 28 pacijenata koji su bili na hemioterapiji (10 muškaraca i 18 žena), kao i 18 pacijenata bez hemioterapije (10 muškaraca i 8 žena), (Tabela 1). Pacijenti su bili u četvrtom stadijumu bolesti.

Uz odobrenje Evropske organizacije za istraživanje i lečenje raka (engl. *European Organisation for Research and Treatment of Cancer – EORTC*), (*ID* zahteva: 89647), za procenu kvaliteta života korišćen je standardni *EORTC QLQ-C30* upitnik sa 30 pitanja [36]. Pacijenti su dobrovoljno, uz usmeni pristanak, popunjavali upitnik pre početka upotrebe biljnih preparata i nakon tri meseca upotrebe.

Preparati biljnih ekstrakata anamua, moringe i spiruline, plus hlorele, inkapsulirani su pojedinačno u tri želatinske kapsule od 400 mg, 500 mg i 500 mg, sa proporcijom od 80% spiruline i 20% hlorele. Svi pacijenti su potvrdili komplijansu korišćenja preparata u kućnim uslovima, posle tri meseca.

U skladu sa preskripcijom preparata, tokom prve nedelje terapija je primenjivana u formi po jedna kapsula svakog dijetetskog suplementa, samo ujutru. U

In Serbia, the application of phytotherapy is still at a modest level. Serbian authors have shown that almost a third of patients believe that they can cure their disease with these methods, while the majority expect to achieve better treatment results with conventional methods than with alternative ones [40].

Study aim

The aim of the study was to assess the effect of the application of plant extracts from Cuba: anamu, moringa, spirulina, and chlorella, as dietary supplements, on the quality of life of oncology patients, during and after the application of oncology therapy.

MATERIALS AND METHODS

Fourty-six patients were included in the post-marketing prospective non-randomized study. Patients who agreed to fill out a questionnaire on quality of life before using herbal preparations were included. The extracts were previously registered in Serbia as a dietary supplement, and the patients received them as a donation from Cuban doctors. The study included patients suffering from various malignant tumors (nine patients with breast cancer, seven with lung cancer, six with colon cancer, five with prostate cancer, four with head and neck cancer, three with lymphoma, two with cervical cancer and one with ovarian cancer, two with stomach cancer, two with urinary tract cancer, two with brain cancer, two with soft tissue sarcoma, and one with pancreatic cancer). Of these patients, 20 were men and 26 were women, aged from 30 to 87 years, with the average age of 60. The patients underwent regular oncological follow-up, every three months, with their oncologist, in different oncological centers in Serbia.

There were 28 patients who received chemotherapy (10 men and 18 women), as well as 18 patients without chemotherapy (10 men and 8 women), (Table 1). The patients were in stage four of the disease.

With the approval of the European Organization for Research and Treatment of Cancer (EORTC), (Request ID: 89647), the standard EORTC QLQ-C30 questionnaire with 30 questions was used to assess quality

Tabela 1. Karakteristike ispitanika

Table 1. Respondent characteristics

	Broj / *Number* (%)	Starost / *Age*			Hemioterapija / *Chemotherapy*	
		Godine / *Years*	Medijana / *Median*	Aritmetička sredina / *Mean*	Da / *Yes*	Ne / *No*
Muški / *Male*	20 (44%)	30 – 84	65	62.05	10	10
Ženski / *Female*	26 (56%)	32 – 87	58	60.04	18	8
Ukupno / *Total*	46 (100%)	30 – 87	60.5	60.91	28	18

Tabela 2. Sistem bodovanja *EORTC QLQ-30*, Verzija 3.0

Table 2. EORTC QLQ-30 scoring system, Version 3.0

	Skala / *Scale*	Broj pitanja / *No. of questions*	Raspon odgovora / *Range of answers*	Verzija 3.0 Broj pitanja / *Version 3.0 No. of ques-tions*	Skala funkcije / *Functional scale*
Opšte zdravstveno stanje / *Global health status* **/ QoL**					
Opšte zdravstveno stanje / *Global health status / QoL* (ispitano)† / *(assessed)†*	*QL2*	2	6	29, 30	
Funkcionalne skale / *Functional scales*					
Fizičko funkcionisanje (ispitano)† / *Physical functioning (assessed)†*	*PF2*	5	3	1 do 5	F
Svakodnevno funkcionisanje (ispitano)† / *Daily functioning (assessed)†*	*RF2*	2	3	6, 7	F
Emotivno funkcionisanje / *Emotional functioning*	*EF*	4	3	21 do 24	F
Kognitivno funkcionisanje / *Cognitive functioning*	*CF*	2	3	20, 25	F
Socijalno funkcionisanje / *Social functioning*	*SF*	2	3	26, 27	F
Skale simptoma / pitanja / *Symptoms scales / questions*					
Zamor / *Fatigue*	*FA*	3	3	10, 12, 18	
Mučnina i povraćanje / *Nausea and vomiting*	*NV*	2	3	14, 15	
Bolovi / *Pain*	*PA*	2	3	9, 19	
Dispneja / *Dyspnea*	*DZ*	1	3	8	
Nesanica / *Insomnia*	*SL*	1	3	11	
Gubitak apetita / *Los of appetite*	*AP*	1	3	13	
Konstipacija / *Constipation*	*CO*	1	3	16	
Dijareja / *Diarrhea*	*DI*	1	3	17	
Finansijske poteškoće / *Financial difficulties*	*FI*	1	3	28	

drugoj nedelji po jedna kapsula svakog dijetetskog suplementa, ujutru i popodne. U trećoj nedelji, po jedna kapsula svakog dijetetskog suplementa, ujutro, popodne i uveče. Od četvrte nedelje, pacijenti su uzimali po dve kapsule svakog dodatka ishrani, ujutru, popodne i uveče. Anamu je konzumiran 15 minuta pre obroka, a moringa i spirulina, tokom ili posle obroka.

Za obradu dobijenih rezultata korišćeni su *EORTC* sistem bodovanja [37] i standardne statističke metode – Wilcoxonov test, hi-kvadrat test i Fišerov test tačne verovatnoće, sa ciljem da se utvrdi postojanje statističke značajnosti, pre i posle primene preparata.

Prema sistemu bodovanja, upitnik je podeljen na pet funkcionalnih skala, tri skale simptoma, skalu opšteg zdravstvenog stanja/kvaliteta života i šest pojedinačnih stavki (Tabela 2).

Više vrednosti rezultata na funkcionalnoj skali, od 1 do 5, predstavljaju visok/zdraviji nivo funkcionisanja. Viši skor na skali opšteg zdravstvenog stanja, od 1 do 7, predstavlja bolji kvalitet života. Sa druge strane, viši rezultat na skali simptoma, od 1 do 5, predstavlja intenzivniji nivo simptoma/problema.

of life [36]. The patients gave verbal consent and voluntarily filled out the questionnaire before starting to use the herbal preparations and after three months of use.

Preparations of herbal extracts of anamu, moringa and spirulina, plus chlorella, are individually encapsulated in three gelatin capsules of 400 mg, 500 mg and 500 mg, with a proportion of 80% spirulina and 20% chlorella. All patients confirmed compliance with the use of the preparation at home, after three months.

In keeping with the prescription for the preparation, during the first week the therapy was taken in the form of one capsule of each dietary supplement, in the morning only. In the second week, one capsule of each dietary supplement, in the morning and in the afternoon, was taken. In the third week, one capsule of each dietary supplement was taken, morning, afternoon and evening. From the fourth week onwards, patients took two capsules of each dietary supplement, in the morning, in the afternoon, and in the evening. Anamu was taken 15 minutes before a meal, and moringa and spirulina, during or after a meal.

The EORTC scoring system [37] and standard statistical methods – Wilcoxon test, chi-square test, and Fisher's exact test, were used to process the obtained

REZULTATI

Ispitane grupe, prema polu i primeni hemioterapije, nisu su razlikovale po svojim karakteristikama, osim što su žene pre primene terapije imale nešto lošije kognitivne funkcije na funkcionalnoj skali (rezultat: 64,1 ± 31,51 naspram 44,17 ± 28,24, p = 0,027).

Procena opšteg zdravstvenog stanja pacijenata i kvaliteta života prema dobijenim rezultatima se statistički značajno poboljšala nakon tri meseca upotrebe preparata (Grafikon 1).

Na funkcionalnoj skali, statistički značajna poboljšanja su zabeležena kod pet parametara (Grafikon 2).

Na skali simptoma, zabeleženo je statistički značajno poboljšanje svih parametara osim dispneje i ekonomskih problema (Grafikon 3).

Nakon primene preparata, žene su statistički postigle nešto bolji rezultat na funkcionalnoj skali fizičke funkcionalnosti, a muškarci nešto bolji rezultat na skali kognitivne funkcionalnosti (Grafikon 4). Na skali simptoma, žene su imale značajnije poboljšanje osećaja zamora i bola od muškaraca (Grafikon 5). Postoji veća razlika u apsolutnom skoru za zamor pre i posle primene preparata kod žena, što je i statistički značajno (106,7 ± 15,88 naspram 97,44 ± 19,7, pre, i 41,67 ± 17,24 naspram 27,78 ± 17, posle).

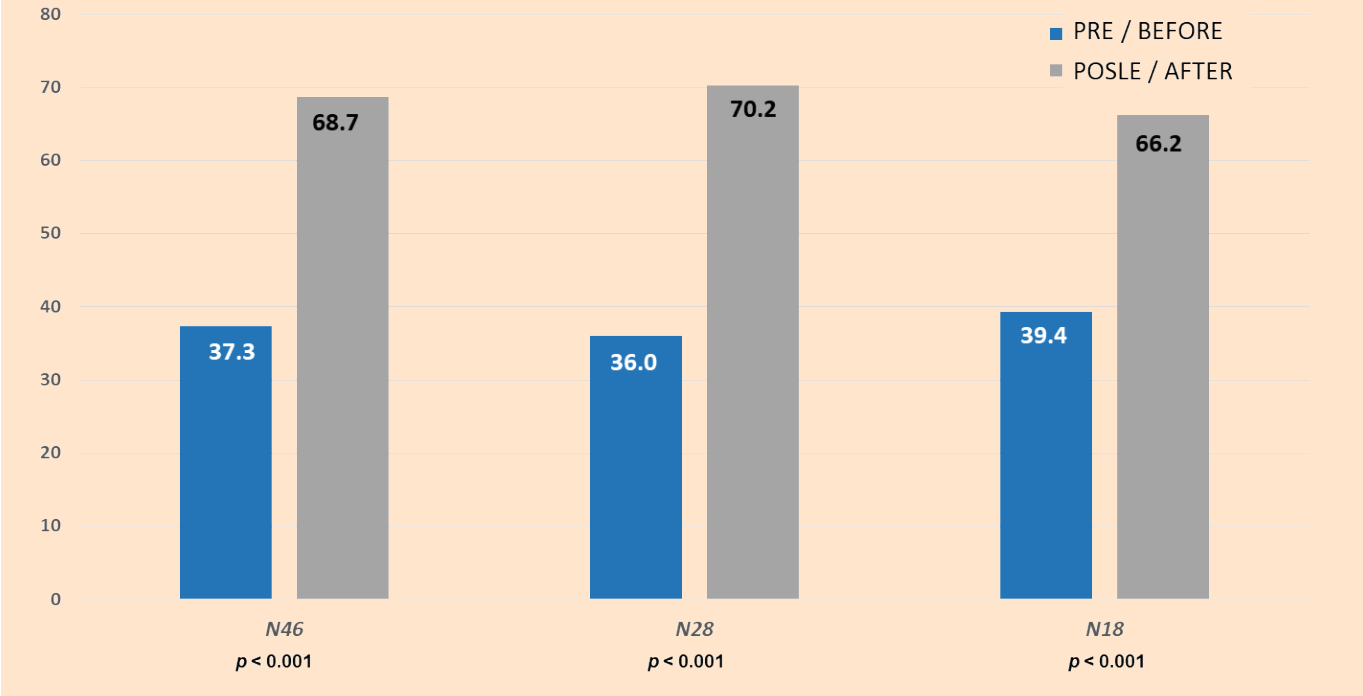
U podgrupi pacijenata koji su primali hemioterapiju, na skali funkcionalnosti je postignuto statistički značajno poboljšanje emocionalne funkcionalnosti posle

RESULTS

The examined groups, according to gender and application of chemotherapy, did not differ in their characteristics, except for the fact that, before the application of therapy, women had slightly worse cognitive functions on the functional scale (result: 64.1 ± 31.51 vs. 44.17 ± 28.24, p = 0.027).

The assessment of patient global health status and quality of life, according to the results obtained, improved statistically significantly after three months of using the preparation (Graph 1).

On the functional scale, statistically significant improvement was recorded for five parameters (Graph 2).



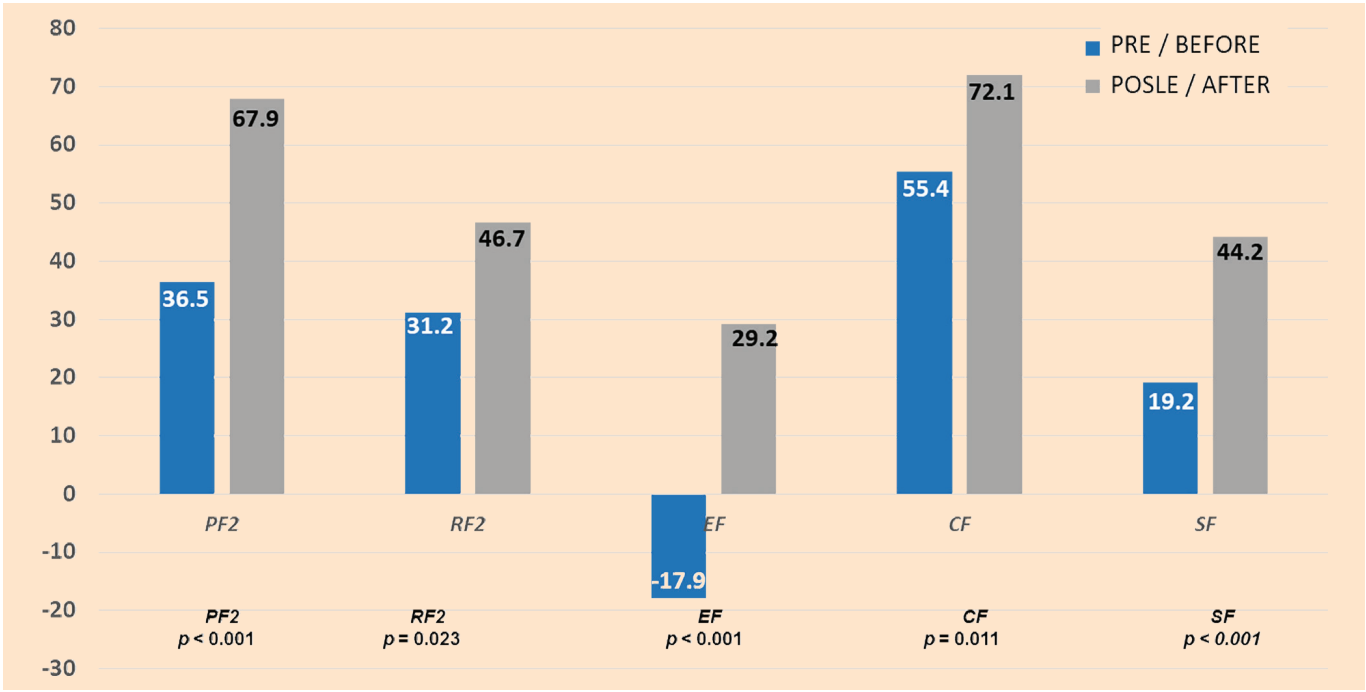
Slika 1. Skor opšteg zdravstvenog stanja i kvaliteta života, pre i posle upotrebe preparata, u celoj grupi ispitanika (N46) i podgrupama, tokom hemioterapije (HT) (N28) i bez ht (N18)

Figure 1. Global health status and quality of life score, before and after the use of the preparation, in the entire group of respondents (N46) and in the subgroups, during chemotherapy (HT) (N28) and without ht (N18)

primene fitoterapije, i ono je bilo značajnije nego u podgrupi koja nije primala hemioterapiju (Grafikon 6). Za ostale parametre funkcionalnosti za koje je dobijena statistički značajna razlika. (Grafikon 2), nije bilo razlike između onih koji su primali hemioterapiju ili ne.

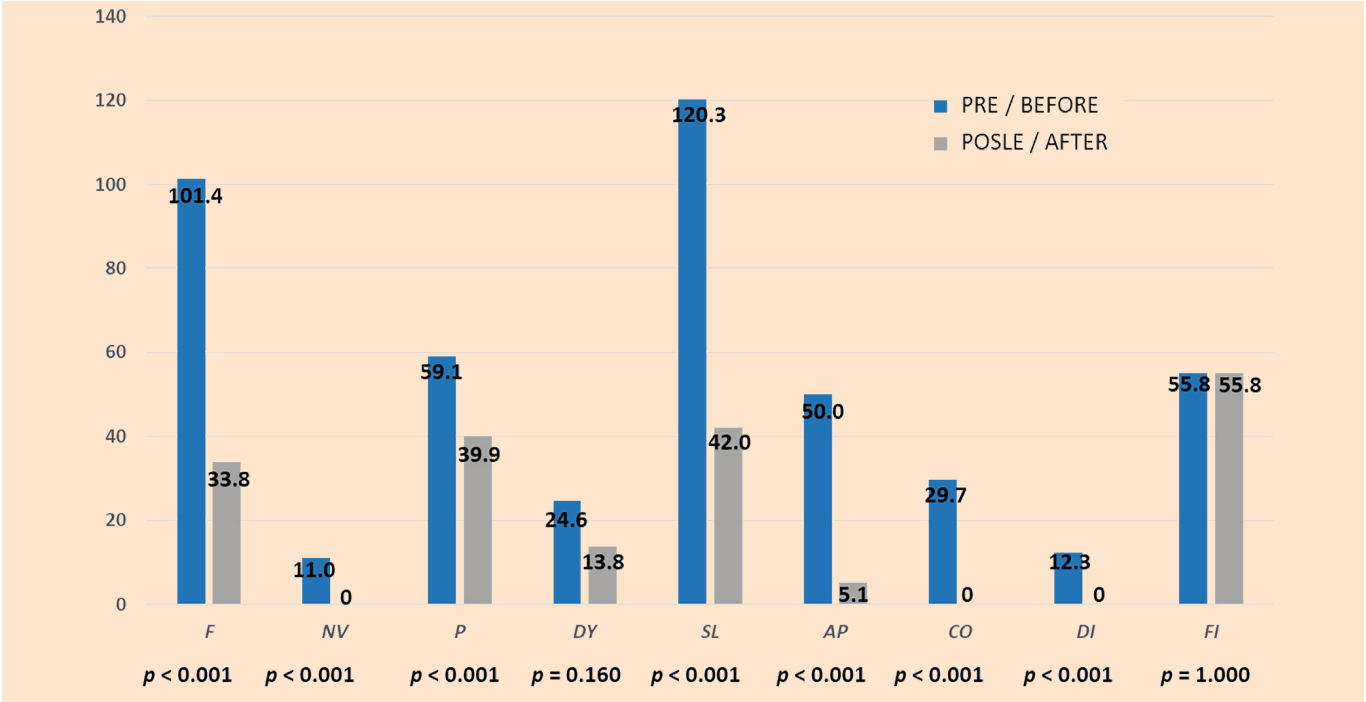
On the symptoms scale, a statistically significant improvement was noted in all parameters except for dyspnea and financial difficulties (Graph 3).

After using the preparation, women statistically achieved a slightly better result on the functional



Slika 2. Skor funkcionalne skale: fizička (PF2), opšta (RF2), emocionalna (EF), kognitivna (CF) i socijalna (SF), pre i posle upotrebe preparata (cela grupa), (N46)

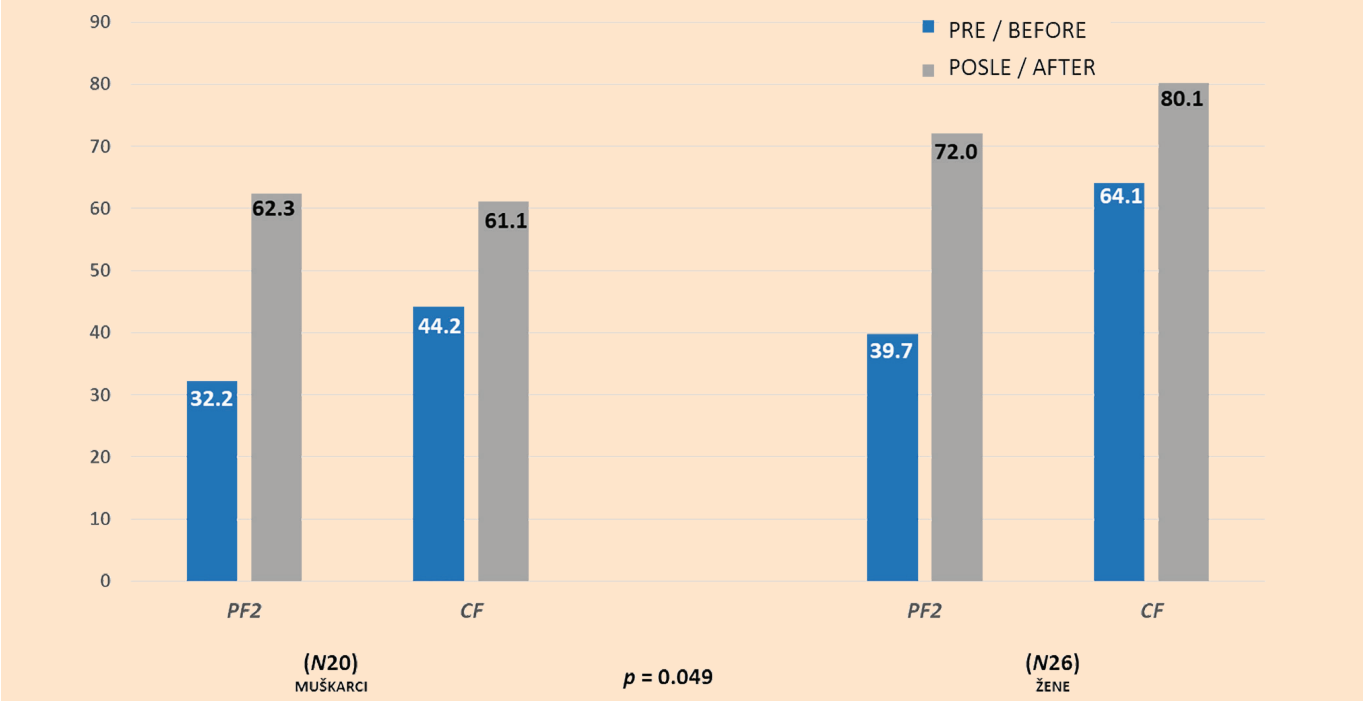
Figure 2. Functional scale score: physical (PF2), role (RF2), emotional (EF), cognitive (CF), and social (SF), before and after the use of the preparation (the whole group), (N46)



Slika 3. Skala simptoma: zamor (F), mučnina i povraćanje (NV), bol (P), dispneja (DY), nesanica (SL), gubitak apetita (AP), konstipacija (CO), dijareja (DI) i finansijski problemi (FI), u celoj grupi (N46)

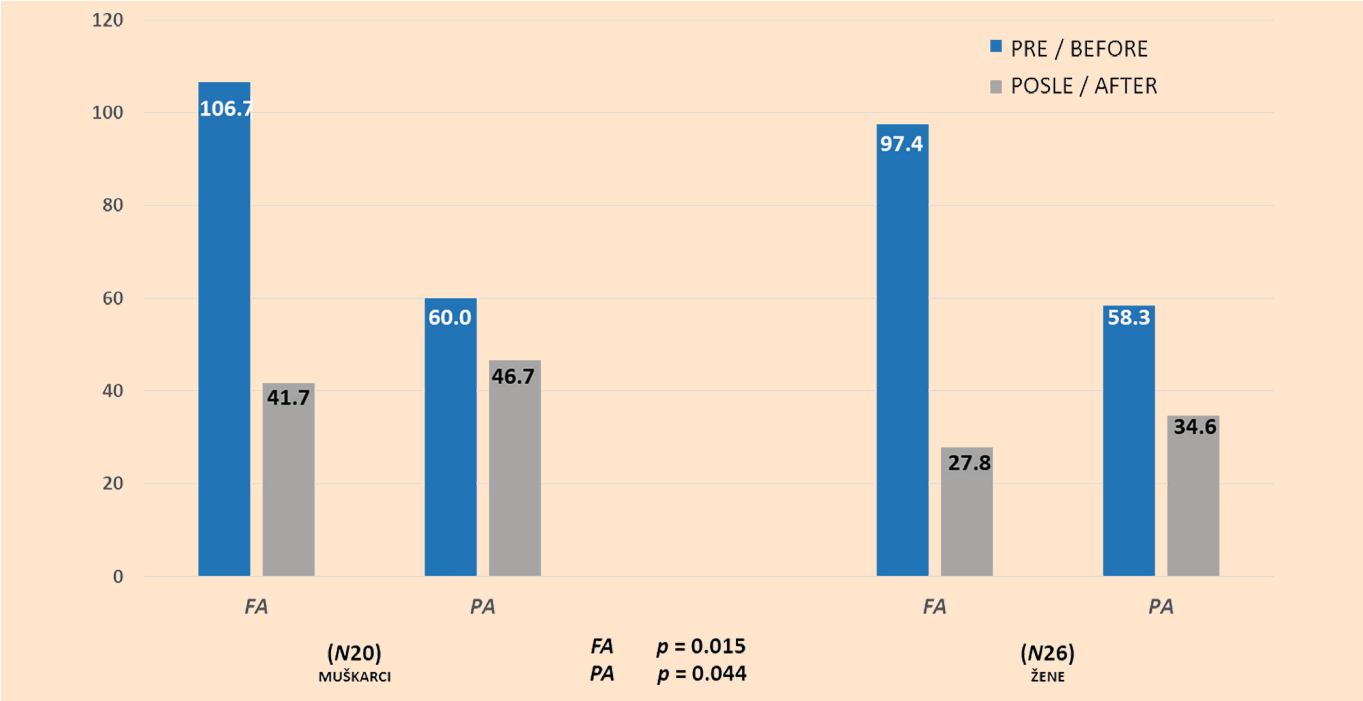
Figure 3. Symptoms scale: fatigue (F), nausea and vomiting (NV), pain (P), dyspnea (DY), sleeplessness (SL), loss of appetite (AP), constipation (CO), diarrhea (DI), and financial difficulties (FI), in the whole group (N46)

Kod pacijenata koji su primali hemioterapiju pre primene preparata, postojala je značajna razlika u skali simptoma gubitka apetita i konstipacije. Ova razlika je nestala nakon tri meseca upotrebe leka i podscale of physical functioning, while men achieved a slightly better result on the scale of cognitive functioning (Graph 4). On the symptoms scale, women had a more significant improvement regarding the



Slika 4. Funkcionalna skala: fizička funkcionalnost (PF2) i kognitivna funkcionalnost (CF), Razlike prema polu, pre i posle terapije

Figure 4. IFunctional scale: physical functioning (PF2) and cognitive functioning (CF), Differences by sex, before and after therapy

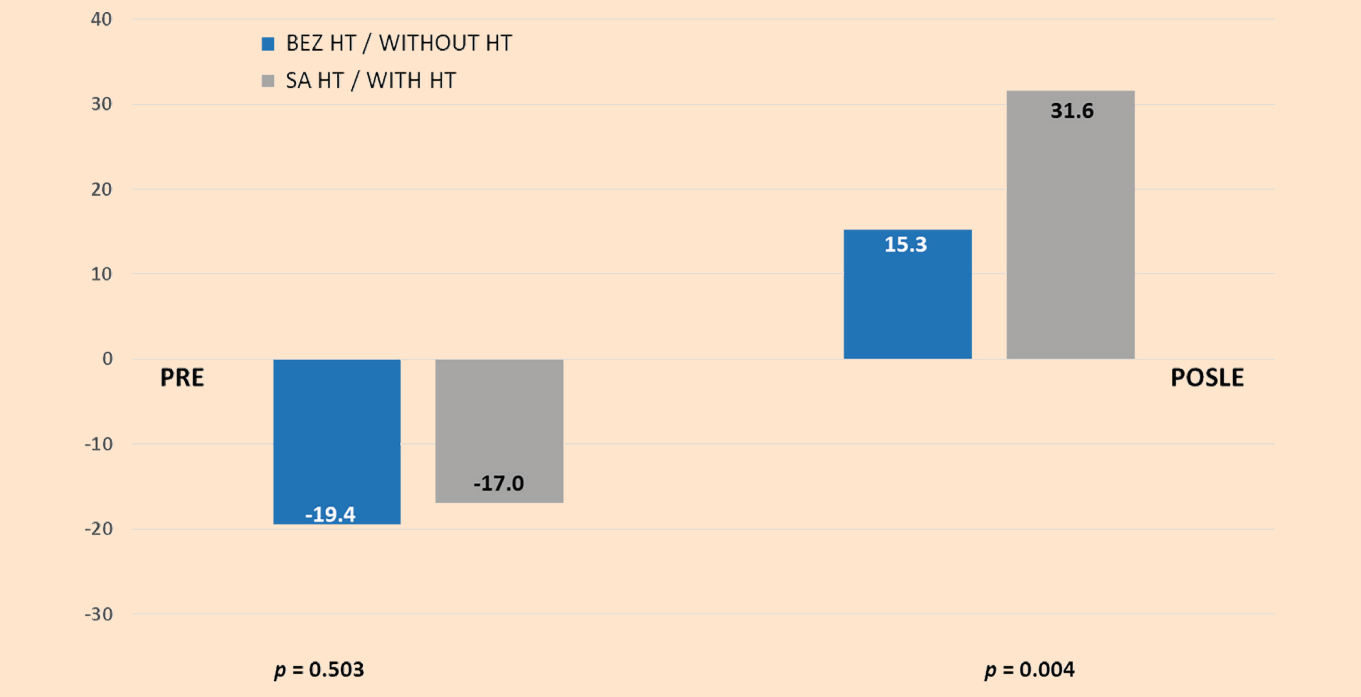


Slika 5. Skala simptoma: zamor (FA), bol (PA), razlika prema polu, pre i posle terapije

Figure 5. ISymptoms scale: fatigue (FA), pain (PA), differences by sex, before and after thera

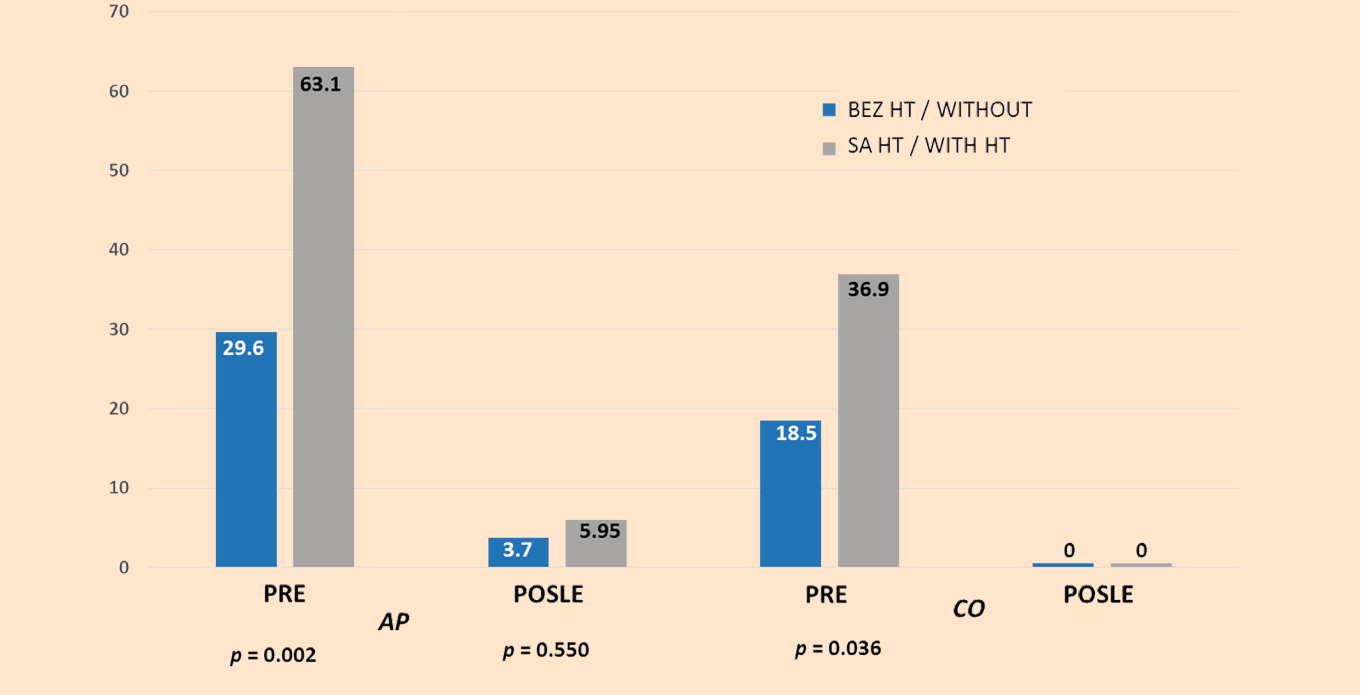
grupe su bile izjednačene u pogledu smanjenja ovih simptoma (Grafikon 7).

sensation of fatigue and pain than men (Graph 5). There is a greater difference in the absolute score for fatigue, before and after the application of the preparation in women, which is also statistically significant



Slika 6. Skala funkcionalnosti: emocionalna (EF), u grupi pacijenata koji su primali hemioterapiju (N28) i grupi pacijenata bez hemioterapije (N18), u toku korišćenja preparata

Figure 6. Functional scale: emotional (EF), in the group of patients who were on chemotherapy (N28) and in the group of patients who did not receive chemotherapy (N18) during the use of the preparation



Slika 7. Bodovanje skale simptoma, gubitak apetita (AP) i konstipacija (CO), kod pacijenata tokom hemioterapije (N28) i pacijenata bez hemioterapije (N18) tokom korišćenja preparata

Figure 7. Symptoms scale scoring, loss of appetite (AP) and constipation (CO), in patients during chemotherapy (N28) and in patients who were not on chemotherapy (N18) during the use of the preparation

DISKUSIJA

Istraživanje je imalo za cilj da analizira kvalitet života pacijenata sa različitim malignim tumorima, pre i tri meseca posle primene ekstrakata iz biljaka anamu, moringa, spirulina i hlorela.

Najvažniji rezultati istraživanja pokazuju da su se, nakon tri meseca upotrebe preparata, kod pacijenata značajno poboljšali svi funkcionalni parametri (fizičko, svakodnevno, emotivno, kognitivno, socijalno funkcionisanje), bez obzira na to da li su primali hemioterapiju i bez razlike u odnosu na pol.

Neželjeni efekti citotoksičnih lekova značajno narušavaju kvalitet života tokom lečenja. Među njima su najčešći mučnina i povraćanje, gubitak apetita i gubitak težine [43]. U našoj studiji, pacijenti na hemioterapiji imali su značajno veći skor na skali gubitka apetita od onih koji nisu primali hemioterapiju. Nakon tri meseca fitoterapije, došlo je do statistički značajnog smanjenja 7 od 9 simptoma na skali simptoma, kao što su zamor, mučnina i povraćenje, bol, dispneja, nesanica, gubitak apetita i konstipacija Najznačajnije poboljšanje je postignuto za gubitak apetita i konstipaciju (Grafikon 7).

Iako je poznato da kombinacija lekova za hemioterapiju i bioaktivnih supstanci iz lekovitog bilja može imati antikancerogeno dejstvo, uz smanjenje neželjenih efekata [47], naša studija nije mogla da analizira moguće antikancerogene efekte biljaka anamu, spirulina, hlorela i moringa, koje su opisane u literaturi koja se bavi upotrebom ovih biljaka [20,40], zbog malog broja ispitanika i heterogene grupe maligniteta koji su lečeni različitim metodama. Rezultati ovog istraživanja odnose se samo na anamu, moringu, spirulinu i hlorelu i ne mogu se odnositi na ostalo lekovito bilje. Prema Svetskoj zdravstvenoj organizaciji, od 2.500.000 vrsta biljaka, 80.000 ima terapeutska svojstva, a oko 21.000 ima potencijal da se koristi kao lekovito bilje [40].

Minimalne razlike i nešto bolji efekti kod žena, na skali fizičke funkcionalnosti, kao i za bol i zamor, na skali simptoma, mogu se objasniti većom opštom ranjivosti ženske populacije.

Poboljšanje emocionalne funkcionalnosti kod pacijenata na hemioterapiji je posebno značajno, jer podiže moral i želju za borbom protiv bolesti.

Analizom skale simptoma pre upotrebe biljnih preparata uočava se da postoji značajna razlika, u pogledu izraženije simptomatologije, kod pacijenata koji su primali hemioterapiju, u odnosu na one koji nisu, što je i bilo očekivano. Nakon tri meseca upotrebe preparata, ove razlike su nestale, uz značajno poboljšanje i smanjenje 7 od 9 procenjivanih simptoma.

Ideja da biljni lek dopuni konvencionalni komercijalni tretman postaje sve popularnija, jer bi time mogle da se prevaziđu finansijske poteškoće kao i zdravstveni

(106.7 ± 15.88 vs. 97.44 ± 19.7, before, and 41.67 ± 17.24 vs. 27.78 ± 17, after).

In the subgroup of patients who received chemotherapy, a statistically significant improvement in emotional functioning was achieved on the functional scale after the application of phytotherapy, and it was more significant than in the subgroup that did not receive chemotherapy (Graph 6). For other functionality parameters, for which a statistically significant difference was registered. (Graph 2), there was no difference between those patients who received chemotherapy and those who did not.

In patients who received chemotherapy before starting on the preparation, there was a significant difference in the symptoms scale regarding the loss of appetite and constipation. This difference disappeared after three months of drug use and the subgroups were equal in terms of the reduction of these symptoms (Graph 7).

DISCUSSION

The study aimed to analyze the quality of life of patients with various malignant tumors, before and three months after the application of extracts from the plants anamu, moringa, spirulina and chlorella.

The most important results of this study show that, after three months of using the preparation, all functional parameters (physical, daily functioning, emotional, cognitive, and social functioning) improved significantly in patients, regardless of whether they received chemotherapy or not, and without gender differences.

Side effects of cytotoxic drugs significantly impair the quality of life during treatment. Among them, the most common are nausea and vomiting, loss of appetite, and weight loss [43]. In our study, patients receiving chemotherapy had significantly higher scores on the appetite loss scale than those not receiving chemotherapy. After three months of phytotherapy, there was a statistically significant reduction in 7 out of 9 symptoms on the symptoms scale, such as fatigue, nausea and vomiting, pain, dyspnea, insomnia, loss of appetite and constipation. The most significant improvement was achieved for loss of appetite and constipation (Graph 7).

Although it is known that the combination of chemotherapy drugs and bioactive substances from medicinal plants can have anticancerous effects, while reducing side effects [47], our study could not analyze the possible anticancerous effects of anamu, spirulina, chlorella, and moringa, which have been described in literature dealing with the use of these plants [20,40], due to the small number of subjects and the heterogeneous

problemi prouzrokovani savremenim tretmanima. Biljni lekovi bi bili jeftiniji, što bi ih učinilo dostupnijim ljudima u ruralnim i siromašnim sredinama. Ovi lekovi bi imali manje neželjenih efekata i stoga bi poboljšali kvalitet života osobe tokom lečenja [44]. Kombinacija više biljnih komponenti bi trebalo da ima veći potencijal i više efekata na bolest od jedne biljke, kao posledica sinergističkog efekta njenih komponenti [45]. Postoje dokazi da brojne aktivne komponente raznih biljnih mešavina deluju na maligne ćelije i druge bolesti. Osim toga, pogodne su za savladavanje otpora na terapije jer deluju na različite mete [46].

S obzirom da su preparati biljnih ekstrakata registrovani u Srbiji i dostupni su svim onkološkim pacijentima, mogu se koristiti kao dodatak u suportivnoj i simptomatskoj terapiji, u cilju poboljšanja kvaliteta života pacijenata.

Iako je studija urađena na malom broju ispitanika i heterogena je po patologiji tumora, daje informaciju o efektima kubanskih biljnih preparata za koje nema mnogo informacija u medicinskim stručnim časopisima. Ovo nas upućuje da iniciramo dodatna istraživanja na većem broju ispitanika i na određenim tumorima.

ZAKLJUČAK

Prema dobijenim ocenama ispitanika, ukupna procena opšteg zdravstvenog stanja i kvaliteta života pacijenata pokazala je da su se oni značajno poboljšali, što ukazuje na korist od konzumiranja dodataka ishrani napravljenih od biljaka anamu, moringa, spirulina i hlorela, za kvalitet života i za smanjenje simptoma onkoloških pacijenata.

Opisana poboljšanja su prisutna i kod pacijenata sa dijagnostikovanom bolešću koji nisu primali konvencionalnu terapiju i kod pacijenata koji su bili na hemioterapiji.

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Sukob interesa: Nije prijavljen.

group of malignancies that were treated with different methods. The results of this study refer only to anamu, moringa, spirulina and chlorella and cannot be applied to other medicinal plants. According to the World Health Organization, out of 2,500,000 species of plants, 80,000 have therapeutic properties and about 21,000 have the potential to be used as medicinal plants [40].

Minimal differences and slightly better effects in women, on the physical functionality scale, as well as for pain and fatigue, on the symptoms scale, can be explained by the greater general vulnerability of the female population.

Improvement in emotional functionality in chemotherapy patients is particularly significant, as it boosts morale and the desire to fight the disease.

Analysis of the symptoms scale before the use of herbal preparations shows that there is a significant difference, in terms of more pronounced symptomatology, in patients who received chemotherapy, as compared to those who did not, which was to be expected. After three months of preparation use, these differences among patients disappeared, with a significant improvement and reduction in 7 out of 9 of the assessed symptoms.

The idea of herbal medicine complementing conventional commercial treatment is becoming increasingly popular, as it could overcome financial difficulties as well as health problems caused by modern treatments. Herbal medicines would be cheaper, making them more accessible to people in rural and poor areas. These drugs would have fewer side effects and therefore improve the patient's quality of life during treatment [44]. The combination of several plant components should have a greater potential and more effects on the disease than a single plant, as a consequence of the synergistic effect of its components [45]. There is evidence that numerous active components of various herbal mixtures act on malignant cells and other diseases. In addition, they are suitable for overcoming resistance to therapies because they act on different targets [46].

Given that preparations of plant extracts are registered in Serbia and are available to all oncology patients, they can be used as a supplement in supportive and symptomatic therapy, with the aim of improving the quality of life in patients.

Although the study was conducted on a small number of subjects and is heterogeneous in terms of tumor pathology, it provides information on the effects of Cuban herbal preparations for which there is not much information in medical professional journals. This indicates the need for additional research on a larger number of subjects and in relation to specific tumors.

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CONCLUSION

According to the obtained respondent answers, the overall assessment of the global health status and quality of life of the patients showed that they improved significantly, which indicates the benefit of consuming nutritional supplements made from the plants anamu, moringa, spirulina and chlorella, for the quality of life and for reducing the symptoms in oncology patients.

The improvements described are present both in patients with diagnosed disease who did not receive conventional therapy and in patients who received chemotherapy.

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