Original article

UDC: 615.8:613.86-056.246
doi: 10.5633/amm.2025.0318

AN IMPACT OF RADIOTHERAPY ON PSYCHO-EMOTIONAL CHARACTERISTICS OF CANCER PATIENTS

Ana Volarević[1], Nikolina Kastratović[4,3], Neda Milosavljević[4,5], Dragica Pavlović[2], Vladislav Volarević[2]

The psychological distress that cancer patients endure can greatly affect their treatment experience and quality of life, making it crucial to understand the psycho-emotional effects of radiotherapy, an established cornerstone in cancer treatment, as this knowledge is vital for creating comprehensive care strategies that address both physical and mental health needs. The study investigated the psycho-emotional effects of radiotherapy in cancer patients with a focus on the interplay of radiotherapy with hormone therapy, biological therapy, and chemotherapy. Our results indicate that while psychological distress is prevalent among patients undergoing radiotherapy, changes in emotional competence, stress reactions, depression, and mature religiosity are similar to those experienced by healthy individuals. Notably, patients receiving radiotherapy exhibited significantly lower scores on the Interpersonal Reactivity Index (IRI), altruism, and the Beck Anxiety Inventory (BAI) compared to healthy controls, suggesting that, while anxiety and empathy fatigue did not increase, reduced altruism could reflect a preoccupation with personal health challenges.

A higher externality score among radiotherapy patients indicates a search for external justifications for their illness. The introduction of hormone therapy significantly increased religiosity scores, enhancing emotional acceptance of illness, while biological therapy resulted in diminished religiosity, likely due to its unfamiliarity and associated skepticism. Importantly, chemotherapy did not significantly alter radiotherapy-induced psycho-emotional effects, reinforcing the notion that familiarity with treatment modalities can foster emotional resilience and a sense of control in patients. In conclusion, this study underscores the importance of addressing psycho-emotional well-being in comprehensive cancer care of radiotherapy-treated patients.

Acta Medica Medianae 2025;64(3): 138–148.

Key words: *radiotherapy, psycho-emotional characteristics, altruism, emotional competence, stress*

[1]University of Kragujevac, Faculty of Medical Sciences, Department of Psychology, Center for Research on Harmful Effects of Biological and Chemical Hazards, Kragujevac, Serbia
[2]University of Kragujevac, Faculty of Medical Sciences, Department of Genetics, Microbiology and Immunology, Kragujevac, Serbia
[3]Center for Research on Harmful Effects of Biological and Chemical Hazards, Kragujevac, Serbia
[3]University of Kragujevac, Faculty of Medical Sciences, Department of Clinical Oncology, Kragujevac, Serbia
[4]University Clinical Center Kragujevac, Department of Clinical Oncology Kragujevac, Serbia

Contact: Ana Volarević
69 Svetozara Markovića St., 34000 Kragujevac, Serbia
E-mail: ana.volarevic@fmn.kg.ac.rs

Introduction

The psychological distress experienced by cancer patients can significantly influence their overall treatment experience and quality of life (1). Patients may grapple with a multitude of emotional challenges, including anxiety, depression, and fear of recurrence, which can be exacerbated by the uncertainties associated with their diagnosis and treatment journey (1).

Radiotherapy is a cornerstone in the treatment of various malignancies (2). Its role in cancer management is well-established, yet the psycho-emotional implications for patients undergoing this treatment are often less thoroughly examined (3). Understanding the psycho-emotional effects of radiotherapy is essential for developing comprehensive care strategies that address both physical and mental health needs (3, 4). When radiotherapy is administered as a standalone treatment, patients often exhibit psychological responses that reflect their coping mechanisms in the face of cancer (4, 5). The stress of receiving a cancer diagnosis, coupled with the physical side effects of treatment, such as fatigue, skin irritation, and changes in body image, can lead to significant emotional burden (4). Moreover, the experience of undergoing radiotherapy can create

feelings of vulnerability and loss of control, which may fuel anxiety and depressive symptoms (4). Thus, it is crucial to explore how patients psychologically adapt to the rigors of radiotherapy and which supportive measures can be implemented to enhance their emotional well-being (5).

The combination of radiotherapy with other treatment modalities, such as hormone therapy and biological therapy, introduces additional layers of complexity to the psycho-emotional landscape (3, 6). Hormone therapy, often prescribed for hormone-sensitive cancers, can induce significant psychological changes (6). While some patients may feel a sense of empowerment from actively participating in their treatment, the side effects associated with hormone therapy, such as mood fluctuations and cognitive changes, can also contribute to increased psychological distress (6). This duality necessitates a deeper exploration of how the combined effects of radiotherapy and hormone therapy shape patients' emotional experiences, especially considering the potential for enhanced religious or spiritual engagement as a coping mechanism (6).

Similarly, the integration of biological therapy with radiotherapy presents a unique challenge (7, 8). Biological or immunotherapies, which often employ novel mechanisms to target cancer, are not as familiar to patients as traditional treatments like chemotherapy or radiation (7). This unfamiliarity can lead to skepticism, anxiety, and a diminished sense of control over their treatment process (8). As patients navigate the complexities of receiving combined biological and radiotherapy, their psychological responses may vary widely, reflecting a spectrum of coping strategies influenced by their understanding of these therapies and their potential outcomes (7, 8).

Furthermore, patients receiving combined chemotherapy and radiotherapy face a distinct set of psycho-emotional challenges (9, 10). Chemotherapy is known for its systemic side effects, which can significantly impact a patient's quality of life (9). The physical toll of chemotherapy, coupled with the localized treatment of radiotherapy, can exacerbate feelings of fatigue, anxiety, and helplessness (9, 10). Understanding the interplay between the physical side effects of chemotherapy and the psychological impacts of radiotherapy is crucial for providing holistic care and support (9).

An investigation of the psycho-emotional effects of radiotherapy, either as a standalone treatment or in combination with hormone therapy, biological therapy, or chemotherapy, offers valuable insights into the emotional challenges faced by cancer patients (3, 4). By examining these dynamics, researchers can better inform clinical practices and interventions aimed at mitigating psychological distress, ultimately enhancing the quality of life for individuals navigating the complexities of cancer treatment (1, 3). Accordingly, this study tended to illuminate the intricate relationship between treatment modalities and their combined effects on patients' emotional well-being, paving the way for more integrated approaches to cancer care.

Materials and Methods

Participants

Participants in this study were patients suffering from malignant disease who underwent radiotherapy alone or in combination with biological therapy or hormonal therapy at Clinical Center Kragujevac, Faculty of Medical Sciences, University of Kragujevac, Serbia (n = 156). All patients had a complete medical history, including physical examination, laboratory tests and diagnostic imaging (chest X-ray, abdominal ultrasound, abdominal computed tomography scan and endoscopy).

Patients were divided into several groups, depending on the therapy that they received (radiotherapy alone, combined radiotherapy and hormone therapy, combined radiotherapy and biological therapy and combined radiotherapy and chemotherapy). The groups were homogenized in number, gender, age, socio-economic status and cultural background. Participants did not differ in occupation, physical assets, social position or area of residence. The control group consisted of 50 healthy individuals. A control group was matched with the experimental groups based on gender, age, socio-economic status and cultural background.

All participants gave their informed consent to participate in this study. An adherence was made to the Principle of Good Clinical Practice and the Declaration of Helsinki at all times. The study was approved by the Ethical Committee of the Faculty of Medical Sciences, University of Kragujevac, Serbia and the Ethical Committee of Clinical Center Kragujevac, Serbia.

Study Design

The psychological tests, previously standardized for the Serbian population, were given to study participants. They volunteered for the study after the tester briefly explained its purpose and assured them that anonymity would be maintained. Trained assistants collected the data under the supervision of a PhD staff member, an associate professor at the Department of Psychology, Faculty of Medical Sciences, and the University of Kragujevac.

Participants responded to standardized psychological tests: Interpersonal Reactivity Index (IRI), Altruism Scale, Externality Scale, Emotional Competence Questionnaire, Coping Inventory for Stressful Situations, and the Religious Maturity Scale (11).

Interpersonal Reactivity Index (IRI)

Interpersonal Reactivity Index (IRI) was used to assess empathy of participants (11, 12). IRI is a multidimensional questionnaire that measures both cognitive and affective aspects of empathy. It is a measure of dispositional empathy which assumes that empathy consists of a set of separate but reciprocally related constructs. The IRI questionnaire contains 28 items answered on a 5-point Likert scale ranging from “Does not describe me well” to “Describes me very well”. The measure has 4 subscales, each made up of 7 different items. These subscales are: Perspective Taking—the tendency to spontaneously adopt the psychological point of view of others; Fantasy—taps respondents' tendencies to transpose themselves imaginatively into the feelings and actions of fictitious characters in books, movies, and plays; Empathic Concern—assesses "other-oriented" feelings of sympathy and concern for unfortunate others; Personal Distress—measures "self-oriented" feelings of personal anxiety and unease in tense interpersonal settings. A total score of empathic responsiveness of the participant, named "Interpersonal Reactivity Index—total (IRIT)" is obtained as the sum of the points scored on these subscales.

Altruism Scale

The Altruism Scale (11, 13) was used for the assessment of altruism. This scale measures pro-social behavior and the tendency to behave in an altruistic way in everyday situations. The Altruism Scale consists of 17 items that describe different behaviors towards friends or strangers, with disregard of the subject’s personal interests and with specific personal sacrifice (example: “I have shown school assignments to a friend who was sick" or “I offered my seat on the bus to an older person"). On a scale of zero to four (0—never; 4—very often), the participant describes how often they behave in the stated manner. Results can range from 0–68 points, and a higher score indicates a higher degree of altruism.

Externality Scale

The Externality Scale (11, 14) was used for determining the externality. This scale measures one dimension of Rotters’ concept of the locus of control. Locus of control can be external or internal. External locus of control reflects a fatalistic orientation of the person who believes that exclusively fate, fortune and predestination have the power to determine the outcome of events. Internal locus of control reflects internal orientation and the belief that individual has the power and control over life events. The Externality Scale consists of 10 items, answered on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Results vary from 10 to 50, and higher results reflect external orientation or external locus of control, while the lower results indicate internal orientation or internal locus of control.

Emotional Competence Questionnaire

Emotional Competence Questionnaire (11, 15) was used for the assessment of emotional intelligence (competence). Participants evaluate how some claims relate to them on a scale from 1—not at all to 5—totally (example: ''I can express my emotions well''). This Scale is one-dimensional; a higher score indicates greater emotional competence.

Coping Inventory for Stressful Situations (CISS)

The Coping Inventory for Stressful Situations (CISS), which analyzes styles of coping as stable personality characteristics, was used to assess the behavior of participants in stressful situations (11, 16). The questionnaire contains 48 items, three subscales with 16 statements and is used for measuring three major types of coping styles: Task-Oriented, Emotion-Oriented and Avoidant Coping. It also identifies two types of avoidance patterns: Distraction and Social Diversion. It helps in identifying an individual’s preferred coping style and contributes to the overall understanding of the relationship between that coping style and their personality. The task of the participant is to assess on a scale from one to five (1—not at all to 5—completely) to what extent they practice a certain type of activity, and how they act in a difficult, stressful or upsetting situation. Coping styles play an important role in physical and psychological well-being.

Religious Maturity Scale

The Religious Maturity Scale (11) was used to assess religiosity of participants. This scale consists of eight items with two statements that refer to the same aspect of religiosity, but express different maturity and intellection. In particular, one statement reflects the religiosity of the second or third stage of Fowler's model (for example: “I think only my faith offers an insightful look into what God wants from us"), while content of the other statement is in accordance with the Fowler's fourth or fifth stage (“Even though my faith has a lot to offer, I think that other religions can provide important religious knowledge"). In each particle, the participant chooses the statement that better reflects their way of thinking, and gets one point if they choose one that reflects a more mature religiosity. The final score is in the range 0–8, where a higher score reflects a more mature religiosity.

Statistical Analysis

All statistics were carried out using SPSS 19.0 for Windows software. Results were analyzed

using the Student's t-test or Mann–Whitney test depending on normal distribution determined by the Kolmogorov–Smirnov test. The data were expressed as mean ± standard error (SEM). Values of $p < 0.05$ were considered statistically significant.

Results

Radiotherapy affects altruism, empathy, anxiety and externality

Detection of psychological distress is often seen among cancer patients, including those undergoing radiotherapy. Results obtained in healthy individuals were similar to results of patients who underwent radiotherapy, indicating that changes in emotional competence (Figure 1A), reaction to stress (Figure 1B), depression (Figure 1C) and mature religiosity (Figure 1D) were not related to the radiation therapy. IRI index (Figure 1E; $p < 0.05$), altruism score (Figure 1F; $p < 0.05$) and BAI score (Figure 1H; $p < 0.05$) were significantly lower in the group of radiotherapy-treated patients compared to healthy controls. Reduced anxiety and empathy scores indicate that radiotherapy didn't induce progress of anxious attachment and empathy fatigue, while reduced altruism may be a response to cancer development since radiotherapy-treated patients are constantly worrying about the future and trying to focus on getting better. On the other hand, the externality score was significantly higher in radiotherapy-treated patients than in healthy subjects (Figure 1G; $p < 0.001$). An increase in externality score may be linked to radiotherapy-treated patients seeking external justification for their illness, rather than possible internal reasons and causes.

There was no significant difference in UEK- 15 (A), CISS (B), BDI (C) and religiosity (D) scores between radiotherapy-treated patients and healthy individuals. IRI index (E), altruism score (F) and BAI score (H) were significantly lower while externality score (G) was significantly lower in the group of radiotherapy-treated patients compared to healthy controls. Values are presented as mean ± SEM; *$p < 0.05$, ***$p < 0.001$.

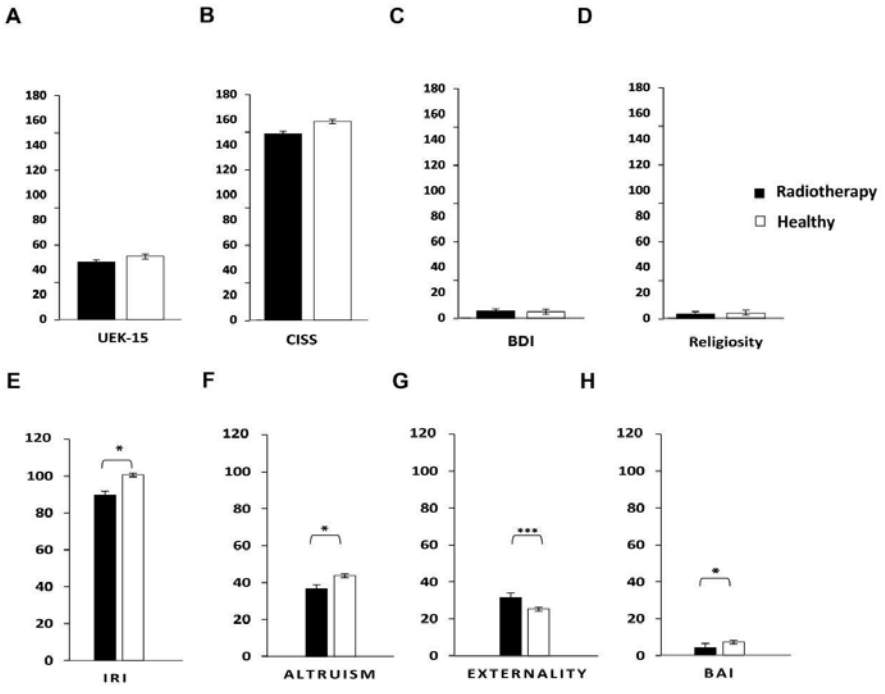

Figure 1. Results of psychological tests obtained in healthy individuals and cancer patients who underwent radiotherapy

Hormone therapy enhances radiotherapy-based effects on religiosity

To analyze the impact of hormone therapy on radiotherapy-induced effects on psycho-emotional well-being, we compared psycho-emotional traits of cancer patients who received radiotherapy with those who underwent combined hormone and radiotherapy. Significantly increased religiosity score was observed in patients treated with both hormone and radiotherapy compared to patients who received only radiotherapy (Figure 2A; $p < 0.05$). These findings suggest that the addition of another treatment approach encouraged emotional orientation towards religion, helping cancer patients to accept illness better. In contrast to religiosity, addition of hormone therapy did not significantly alter radiotherapy-induced effects on IRI, UEK-15, CISS, externality, altruism, BDI and BAI scores of cancer patients (Figure 2B–H).

Religiosity score was significantly increased in cancer patients who received both hormone and radiotherapy compared to patients who received only radiotherapy (A). There was no significant difference in IRI (B), UEK-15 (C), CISS (D), externality (E), altruism (F), BDI (G) and BAI (H) scores between cancer patients treated with radiotherapy and those who received both hormone therapy and radiotherapy. Values are presented as mean ± SEM; *$p < 0.05$.

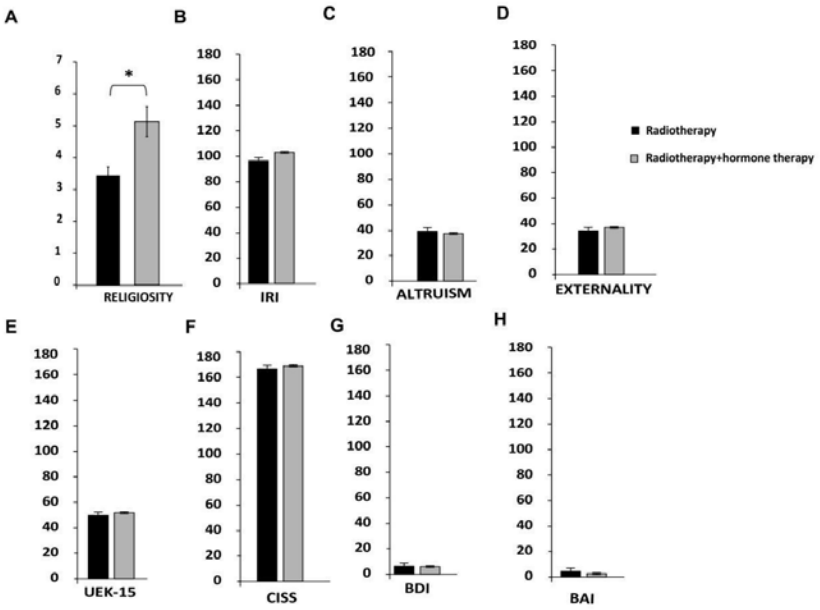

Figure 2. Comparison of psycho-emotional traits of cancer patients who received radiotherapy or combined hormone and radiotherapy

Biological therapy reduces radiotherapy-based effects on religiosity

To assess the influence of biological therapy on the psycho-emotional effects of radiotherapy, we compared the psycho-emotional characteristics of cancer patients who received radiotherapy alone with those who underwent a combination of biological therapy and radiotherapy. Patients treated with both therapies showed a significantly lower religiosity score compared to those receiving only radiotherapy (Figure 3A; $p < 0.05$). Biological therapy is less familiar to patients than radiotherapy and other conventional treatments for malignant diseases, such as surgery and chemotherapy. This lack of knowledge regarding the effectiveness and advantages of biological therapy leads to skepticism about potential improvements. Additionally, the understanding that prior treatments did not cure their cancer, coupled with the need to adopt an unfamiliar approach like biological therapy, contributes to a decrease in religiosity among these patients. In a similar manner as it was observed in patients who received combined hormone and radiotherapy, addition of biological therapy did not significantly alter radiotherapy-induced effects on IRI, altruism, externality, UEK-15, CISS, BDI and BAI scores of cancer patients (Figure 3B–H).

Religiosity score was significantly decreased in cancer patients who received both biological and radiotherapy compared to patients who

received only radiotherapy (A). There was no significant difference in IRI (B), altruism (C), externality (D), UEK-15 (E), CISS (F), BDI (G) and BAI (H) scores between cancer patients treated with radiotherapy and those who received both biological therapy and radiotherapy. Values are presented as mean ± SEM; *p < 0.05.

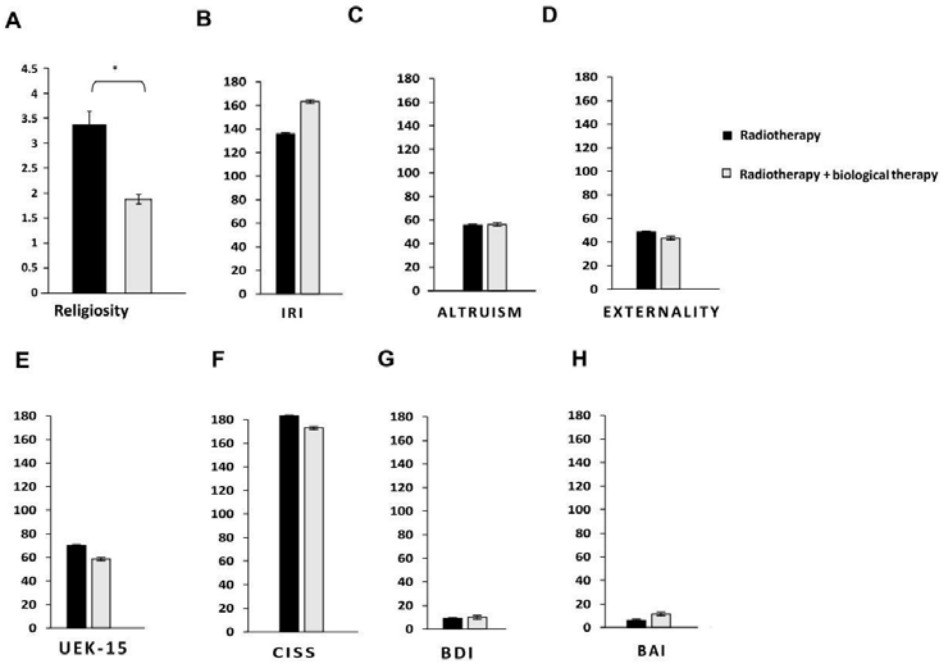

Figure 3. Comparison of psycho-emotional traits of cancer patients who received radiotherapy or combined biological and radiotherapy

Chemotherapy did not significantly alter radiotherapy-induced effects on the psycho-emotional well-being of cancer patients

As it is shown in Figure 4, there were no differences in IRI (Figure 4A), altruism (Figure 4B), externality (Figure 4C), UEK-15 (Figure 4D), CISS (Figure 4E), BDI (Figure 4F), BAI (Figure 4G) and religiosity scores (Figure 4H) of cancer patients treated with radiotherapy and cancer patients who received combined chemotherapy and radiotherapy. We assume that patients tend to be familiar with the beneficial effects of chemotherapy and radiotherapy, since these two therapeutic approaches have been widely used for the treatment of malignant diseases. This familiarity often stems from the extensive discussions between healthcare providers and patients regarding the expectations and possible adverse effects of these therapeutic approaches. Greater awareness and understanding of these therapeutic strategies can significantly enhance the mental well-being of cancer patients, as they are more prepared for the possible outcomes and side effects associated with chemotherapy and radiotherapy. When patients know what to anticipate, they will experience a greater sense of control over their treatment journey.

There was no significant difference in IRI (A), altruism (B), externality (C), UEK-15 (D), CISS (E), BDI (F), BAI (G) and religiosity (H) scores between cancer patients treated with radiotherapy and those who received combined chemotherapy and radiotherapy. Values are presented as mean ± SEM.

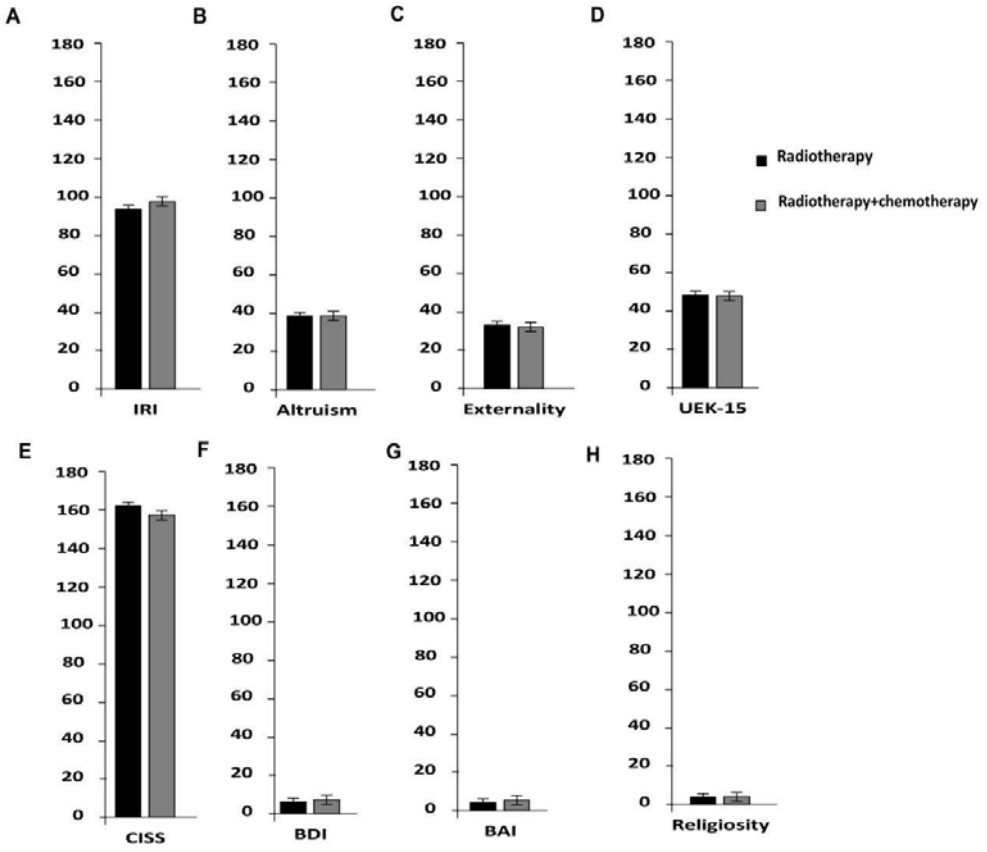

Figure 4. A comparison of the psycho-emotional characteristics of cancer patients who underwent either radiotherapy or a combination of chemotherapy and radiotherapy

Discussion

The results of our study reveal a complex picture of psychological distress among cancer patients undergoing radiotherapy. Notably, the detection of psychological distress is a common experience for these individuals, echoing the findings observed in healthy control subjects (1, 3). The similarities in emotional competence, stress reactions, depression levels, and mature religiosity between the two groups suggest that the emotional challenges faced by patients undergoing radiotherapy may not be directly attributable to the treatment itself. Instead, these changes may reflect broader psychological responses to the stress of a cancer diagnosis and the accompanying uncertainties (3). The significant differences highlighted in the IRI index, altruism score, and BAI scale indicate that while radiotherapy patients do not exhibit increased anxiety or empathy fatigue, they do demonstrate a notable decline in altruism. This reduction in altruism may stem from the intense focus on their illness and the associated need for self-preservation (17). As patients navigate their cancer journey, their worries about the future and the quest for recovery can overshadow their capacity for altruistic behaviors. This suggests a psychological adaptation process, where the immediate survival instinct and the emotional toll of the disease take precedence over empathy and connection with others (17). Conversely, the heightened externality score among radiotherapy-treated patients compared to healthy controls points to a significant psychological coping mechanism (18, 19). This increase may signify an external locus of control, where patients seek to rationalize their illness by attributing it to external factors rather than internal shortcomings (17, 18). The pursuit of justifications for their condition can indicate a psychological struggle to make sense of their circumstances, reflecting a broader human tendency to look for reasons behind adverse events (18, 19). This search for external explanations may serve as a coping strategy, allowing patients to distance themselves from the responsibility of their illness, albeit potentially leading to a sense of helplessness in managing their health (18, 19).

The findings from our analysis shed light on the nuanced effects of hormone therapy when combined with radiotherapy on the psycho-emotional well-being of cancer patients. Notably, the significant increase in religiosity scores among

those receiving both hormone and radiotherapy indicates a potential emotional and psychological benefit derived from the integration of these treatment modalities (6). This enhancement in religiosity may reflect a coping mechanism that helps patients find meaning and solace in their illness, suggesting that the combination of therapies fosters a greater emotional orientation towards spirituality (6). Such a shift can play a crucial role in how patients navigate their cancer journeys, providing them with a support system that transcends the physical aspects of treatment (1, 3). The observed increase in religiosity among patients receiving hormone therapy alongside radiotherapy highlights the multifaceted nature of coping with cancer (6). It suggests that the introduction of hormone therapy may motivate patients to seek comfort and strength in their faith, enhancing their ability to accept and manage their illness (6). This emotional orientation towards religion can have profound implications, as it may bolster resilience, foster community support, and ultimately contribute to improved mental health outcomes (6, 18). As patients integrate their treatment experiences with their spiritual beliefs, they may find a renewed sense of purpose and hope, which can be critical in facing the challenges of cancer (6, 18). Despite the positive impact on religiosity, it is noteworthy that the addition of hormone therapy did not significantly alter other psycho-emotional measures (IRI, UEK-15, CISS, externality, altruism, BDI and BDA). This lack of change suggests that while hormone therapy may enhance certain aspects of psycho-emotional well-being, it does not comprehensively address other emotional domains affected by cancer and radiotherapy (6). The stability of these scores indicates that the underlying psychological stressors associated with cancer diagnosis and treatment remain predominant, and that hormone therapy alone may not be sufficient to alleviate these emotional burdens (1, 6).

The results of our study indicate a noteworthy shift in psycho-emotional characteristics among cancer patients receiving a combination of biological therapy and radiotherapy, particularly in terms of religiosity. The significant decrease in religiosity scores for patients treated with both therapies compared to those receiving radiotherapy alone suggests that the introduction of biological therapy may engender feelings of uncertainty and skepticism (7, 8). This decline in religiosity is particularly striking, as spiritual beliefs often provide a crucial support system for individuals facing significant health challenges (20). The unfamiliarity of biological therapy, when compared to more traditional treatments such as chemotherapy and surgery, likely contributes to patients' hesitance in embracing this new approach, leading to diminished spiritual engagement (7, 20). The skepticism surrounding biological therapy may stem from a lack of comprehensive understanding of its mechanisms and benefits. Unlike established treatments that patients may have heard about or experienced previously, biological therapy is often perceived as a novel and complex option. This unfamiliarity can lead to increased anxiety and uncertainty, ultimately resulting in a diminished sense of control and a weakened connection to spiritual beliefs (20). As patients grapple with the reality that prior treatments may not have been curative, the introduction of an unfamiliar therapy can feel overwhelming, causing them to withdraw from their spiritual practices that typically provide comfort and hope (20, 21). In contrast to the impact on religiosity, it is notable that the addition of biological therapy did not significantly affect empathy, altruism, depression and anxiety in cancer patients. This consistency in scores suggests that while the psycho-emotional landscape changes in some areas, other emotional responses remain relatively stable despite the introduction of biological therapy (20, 22). It underscores the complexity of emotional responses in cancer treatment, indicating that traditional measures of empathy, altruism, and depression may not be as susceptible to change with the addition of a new treatment modality (7, 22).

The absence of significant differences in the scores of evaluated psycho-emotional characteristics between patients receiving radiotherapy and those undergoing combined chemotherapy and radiotherapy suggests that both treatment modalities are similarly understood and accepted by patients, allowing them to maintain consistent emotional landscapes regardless of the specific combination of therapies they are receiving (9). The familiarity that patients possess regarding the effects of both chemotherapy and radiotherapy likely contributes to this uniformity in psycho-emotional responses (9, 23). Given that these treatments have been extensively discussed in medical settings and are widely recognized as standard approaches to combatting cancer, patients may feel more equipped to cope with the complexities of their treatment regimens (9, 23). This increased awareness can lead to greater emotional resilience, as patients who are informed about potential benefits and side effects are better prepared to manage their expectations (24, 25). The familiarity with these therapies can foster a sense of control, which is particularly important in the often tumultuous experience of cancer treatment (23, 24). Importantly, our findings emphasize the importance of effective communication between healthcare providers and patients. When medical teams engage in thorough discussions about treatment options, including the anticipated effects and possible adverse reactions, patients are likely to develop a clearer understanding of their therapeutic journey (9, 25). This understanding not only enhances their preparedness but also empowers them to navigate their emotional responses more effectively (9, 23). As patients feel more in control, their overall mental well-being can improve, leading to a more positive treatment experience (24, 25).

Conclusion

In summary, while radiotherapy itself may not directly exacerbate psychological distress, the emotional landscape of cancer patients is profoundly influenced by their diagnosis and treatment journey. The observed patterns of reduced altruism and increased externality underscore the need for supportive interventions that address the psychological impacts of living with cancer. While hormone therapy may provide specific emotional benefits, particularly in terms of enhancing religiosity, it is crucial to recognize that cancer patients may require more comprehensive support to address the full spectrum of their psycho-emotional needs. Also, there is a critical need for comprehensive educational initiatives aimed at improving patient understanding of biological therapies. By fostering a deeper knowledge of the benefits and side effects of these innovative approaches, healthcare providers can help mitigate skepticism and anxiety in cancer patients. Additionally, integrating psychological support that addresses the emotional and spiritual needs of patients as they navigate their treatment options becomes essential. Such support could facilitate a stronger connection to spirituality, potentially countering declines in religiosity and enhancing overall emotional well-being. Future research should continue to explore the intricate relationship between treatment familiarity and psycho-emotional health, aiming to develop tailored interventions that support radiotherapy-treated patients in embracing all aspects of their cancer care.

References

1. Park S, Sato Y, Takita Y, Tamura N, Ninomiya A, Kosugi T, et al. Mindfulness-Based Cognitive Therapy for Psychological Distress, Fear of Cancer Recurrence, Fatigue, Spiritual Well-Being, and Quality of Life in Patients With Breast Cancer-A Randomized Controlled Trial. J Pain Symptom Manage 2020;60:381-9. [CrossRef][PubMed]
2. Snider JW 3rd, Mehta M. Principles of radiation therapy. Handb Clin Neurol 2016;134:131-47. [CrossRef][PubMed]
3. Man KH, Law HK, Tam SY. Psychosocial needs of post-radiotherapy cancer survivors and their direct caregivers - a systematic review. Front Oncol 2023;13:1246844. [CrossRef][PubMed]
4. Goldsworthy S, Palmer S, Latour JM, McNair H, Cramp M. A systematic review of effectiveness of interventions applicable to radiotherapy that are administered to improve patient comfort, increase patient compliance, and reduce patient distress or anxiety. Radiography (Lond) 2020;26:314-24. [CrossRef][PubMed]
5. Li W, Gan C, Zuo H, Yin X, Jing Y, Pang L, et al. Psychological distress as risk factor for the efficacy of whole-brain radiotherapy in brain metastasis patients. Future Oncol 2023;19:49-60. [CrossRef][PubMed]
6. Plummer C, Steingart RM, Jurczak W, Iakobishvili Z, Lyon AR, Plastaras JP, et al. Treatment specific toxicities: Hormones, antihormones, radiation therapy. Semin Oncol 2019;46:414-20. [CrossRef][PubMed]
7. Pointer KB, Pitroda SP, Weichselbaum RR. Radiotherapy and immunotherapy: open questions and future strategies. Trends Cancer 2022;8:9-20. [CrossRef][PubMed]
8. Arina A, Gutiontov SI, Weichselbaum RR. Radiotherapy and Immunotherapy for Cancer: From "Systemic" to "Multisite". Clin Cancer Res 2020;26:2777-82. [CrossRef][PubMed]
9. Brunner TB. The rationale of combined radiotherapy and chemotherapy - Joint action of Castor and Pollux. Best Pract Res Clin Gastroenterol 2016;30:515-28. [CrossRef][PubMed]
10. Lu Y, Hua J, Yan F, Jiang C, Piao Y, Ye Z, et al. Combined radiotherapy and chemotherapy versus radiotherapy alone in elderly patients with nasopharyngeal carcinoma: A SEER population-based study. Medicine (Baltimore) 2021;100:e26629. [CrossRef][PubMed]
11. Volarevic A, Markovic BS, Jankovic N, Bojic S, Zdravkovic N. Orthodox Catechism affects differences in adolescents's needs for affiliation and aschievement and alters their sense of purpose in life. Ser J Exp Clin Res 2014;15:33-8. [CrossRef]
12. Beadle JN, Brown V, Keady B, Tranel D, Paradiso S. Trait empathy as a predictor of individual differences in perceived loneliness. Psychol Rep 2012;110:3-15. [CrossRef][PubMed]
13. Raboteg-Saric Z, Saric J, Zajc M. A study of values among adolescents: Assessing terminal and instrumental value systems and orientations. Journal for General Social Issues 2013;6:6-32.
14. Alica A, Cericb H, Habibovic S. The Connections of Empathy and Life Styles among Bosnian Students. Procedia-Social and Behavioral Sciences 2015;205:457-62. [CrossRef]

15. Taksic V, Mohoric T, Duran M. Emotional skills and competence questionnaire (ESCQ) as a self-report measure of emotional intelligence. Horizons of Psychology 2009;18:7-21. [CrossRef]
16. Opalach C, Romaszko J, Jaracz M, Kuchta R, Borkowska A, Buciński A. Coping Styles and Alcohol Dependence among Homeless People. PLoS One 2016;11:e0162381. [CrossRef][PubMed]
17. Stiegelis HE, Ranchor AV, Sanderman R. Psychological functioning in cancer patients treated with radiotherapy. Patient Educ Couns 2004;52:131-41. [CrossRef][PubMed]
18. Lu N, Qin T, Hu W. Impact of changes in psychological resilience during treatment with intensity-modulated radiotherapy on nasopharyngeal carcinoma patients: a prospective study. Ann Palliat Med 2022;11:123-134. [CrossRef][PubMed]
19. Wang C, Chen J, Su L, Hua Y, Ye J, Song X, et al. The psychological status in patients with nasopharyngeal carcinoma during radiotherapy. Eur Arch Otorhinolaryngol 2022;279:1035-42. [CrossRef][PubMed]
20. Yeung JWK. Faith-based intervention, change of religiosity, and abstinence of substance addicts. Braz J Psychiatry 2022;44:46-56. [CrossRef][PubMed]
21. Rolfo C, Sortino G, Smits E, Passiglia F, Bronte G, Castiglia M, et al. Immunotherapy: is a minor god yet in the pantheon of treatments for lung cancer? Expert Rev Anticancer Ther 2014;14:1173-87. [CrossRef][PubMed]
22. Belgioia L, Desideri I, Errico A, Franzese C, Daidone A, Marino L, et al. Safety and efficacy of combined radiotherapy, immunotherapy and targeted agents in elderly patients: A literature review. Crit Rev Oncol Hematol 2019;133:163-70. [CrossRef][PubMed]
23. Muszalik M, Repka I, Puto G, Kowal-Skałka J, Kędziora-Kornatowska K. Assessment of Functional Status and Quality of Life of Elderly Patients Undergoing Radiotherapy and Radiotherapy Combined with Chemotherapy - A Cross-Sectional Study. Clin Interv Aging 2021;16:9-18. [CrossRef][PubMed]
24. Xie X, Li H, Wang C, Li W, Xie D, Li M, et al. Effect of modified radical mastectomy combined with neo-adjuvant chemotherapy on postoperative recurrence rate, negative emotion, and life quality of patients with breast cancer. Am J Transl Res 2022;14:460-7.
25. Wang Q, Qi F, Song X, Di J, Zhang L, Zhou Y, et al. A prospective longitudinal evaluation of cognition and depression in postoperative patients with high-grade glioma following radiotherapy and chemotherapy. J Cancer Res Ther 2018;14:S1048-S1051. [CrossRef][PubMed]

Originalni rad **UDC: 615.8:613.86-056.246**
doi: 10.5633/amm.2025.0318

UTICAJ RADIOTERAPIJE NA PSIHOEMOCIONALNE KARAKTERISTIKE PACIJENATA SA MALIGNIM BOLESTIMA

Ana Volarević[1], Nikolina Kastratović[4,3], Neda Milosavljević[4,5], Dragica Pavlović[2,3], Vladislav Volarević[2,3]

[1]Univerzitet u Kragujevcu Katedra za psihologiju, Centar za smanjenje štetnih efekata bioloških i hemijskih hazarda, , Kragujevac, Srbija
[2]Univerzitet u Kragujevcu, Fakultet medicinskih nauka, Katedra za genetiku, mikrobiologiju i imunologiju, Kragujevac, Srbija
[3]Centar za smanjenje štetnih efekata bioloških i hemijskih hazarda, Kragujevac, Srbija
[4]Univerzitet u Kragujevcu, Fakultet medicinskih nauka, Katedra za kliničku onkologiju, Kragujevac, Srbija
[5]Univerzitetski klinički centar Kragujevac, Centar za radijacionu onkologiju, Kragujevac, Srbija

Kontakt: Ana Volarević
Svetozara Markovica 69, 34000 Kragujevac, Srbija
E-mail: ana.volarevic@fmn.kg.ac.rs

Stres može značajno uticati na kvalitet života pacijenata sa malignim bolestima i na njihovo iskustvo u vezi sa primenjenom terapijom. Budući da je radioterapija jedan od najvažnijih terapijskih pristupa u lečenju malignih bolesti, neophodno je da se razume njen uticaj na psihoemocionalno zdravlje kako bi se mogle osmisliti sveobuhvatne strategije za očuvanje i poboljšanje psihičkog i fizičkog zdravlja pacijenata.

U ovom istraživanju ispitivali su se efekti radioterapije na psihoemoconalne karakteristike pacijenata sa malignim bolestima. Takođe, analizirani su efekti primene radioterapije kombinovane sa hormonskom terapijom, biološkom terapijom i hemoterapijom. Dobijeni rezultati ukazuju na to da, uprkos prisustvu stresa kod pacijenata koji primaju radioterapiju, postoje promene u njihovoj emocionalnoj kompetenciji, reakcijama na stres, depresiji i intrinzičnoj religioznosti slične onima koje doživljavaju zdrave osobe. Pacijenti podvrgnuti radioterapiji imali su značajno niži rezultat na Indeksu interpersonalne reaktivnosti (engl. *interpersonal reactivity index* – IRI), na Skali altruizma i na Bekovom indeksu anksioznosti (engl. *Beck anxiety inventory* – BAI) u poređenju sa zdravim ispitanicima.

Porast nuspojava kod pacijenata koji primaju radioterapiju ukazuje na traženje spoljašnjih opravdanja za postojeću bolest. Uvođenje hormonske terapije značajno je povećalo stepen religioznosti i poboljšalo prihvatanje bolesti u emocionalnom smislu. Nasuprot tome, biološka terapija je dovela do smanjenja stepena religioznosti verovatno zbog nepoznavanja mogućih ishoda i posledica primene ove metode lečenja. Važno je pomenuti da hemoterapija nije značajno promenila psihoemocionalne karakteristike izazvane radioterapijom, što može učvrstiti shvatanje da poznavanje terapijskih modaliteta može podsteći emocionalnu otpornost i osećaj kontrole kod pacijenata. U zaključku ovog istraživanja naglašena je važnost očuvanja psihoemocionalnog blagostanja za lečenje i sveobuhvatnu negu pacijenata sa malignim bolestima koji su bili podvrgnuti radioterapiji.

Acta Medica Medianae 2025; 64(3): 138–148.

***Ključne reči**: radioterapija, psihoemocionalne karakteristike, altruizam, emocionalna kompetencija, stres*