HEALTH-RELATED QUALITY OF LIFE IN LUNG CANCER PATIENTS ACCORDING TO TYPE OF TREATMENT

Sandra Karabatić[1,2,6], Ilda Bećirević[3], Božica Lovrić[4,5,6], Tihomir Jovanović[5,7,8]
[1]University Hospital Centre Zagreb, Kišpatićeva 12, 10 000 Zagreb, Croatia
[2]Catholic University of Croatia, Ilica 244, 10 000 Zagreb, Croatia
[3]Rotim Polyclinic, Miramarska cesta 24, 10 000 Zagreb, Croatia
[4]Požega County General Hospital, Osječka 107, 34 000 Požega, Croatia
[5]Faculty of Dental Medicine and Health Osijek, Josip Juraj Strossmayer University of Osijek, Crkvena 21, 31 000 Osijek, Croatia
[6]University of Applied Sciences Ivanić-Grad, Moslavačka 11, 10 310 Ivanić-Grad, Croatia
[7]Pakrac General County Hospital and Croatian Veterans Hospital, Bolnička 74, 34 550 Pakrac, Croatia
[8]Faculty of Medicine, Josip Juraj Strossmayer University of Osijek, Josipa Huttlera 4, 31 000 Osijek, Croatia

Received on 15 October 2025. *Revised on 8 April 2026.* *Accepted on 8 May 2026.*

ABSTRACT

Background: Lung cancer remains one of the leading causes of cancer-related morbidity and mortality worldwide, while quality of life has become an essential outcome measure in contemporary oncological care.

Aim: To assess the impact of different systemic treatment modalities on the quality of life of patients with lung cancer.

Methods: This prospective study was conducted between January and June 2022 at the Department for Lung and Mediastinal Tumors, Clinic for Pulmonary Diseases Jordanovac, University Hospital Centre Zagreb, Croatia. A total of 162 patients undergoing chemotherapy, immunotherapy, targeted therapy, or combined therapy following surgery were included. Quality of life was assessed using the EORTC QLQ-C30 questionnaire at baseline and two months after treatment initiation. Statistical analyses included the Wilcoxon signed-rank test and Kruskal–Wallis test.

Results: Global health status significantly improved two months after treatment initiation ($P = 0.03$), while fatigue ($P = 0.04$) and dyspnea ($P = 0.04$) decreased compared with baseline values. Financial difficulties increased significantly during treatment ($P = 0.009$). Patients receiving chemotherapy reported significantly poorer emotional ($P = 0.002$) and social functioning ($P = 0.02$) than those receiving immunotherapy. Cognitive functioning was significantly higher in patients treated with immunotherapy compared with chemotherapy or combined therapy ($P = 0.001$). Overall functioning ($P = 0.01$) and symptom burden ($P = 0.005$) were most favorable among patients receiving immunotherapy.

Conclusion: Treatment modality significantly affects quality of life in patients with lung cancer, with immunotherapy demonstrating the most favorable functional and symptomatic outcomes.

Keywords: Lung Neoplasms, Quality of Life, Immunotherapy, Chemotherapy, Targeted Therapy.

Corresponding author: Sandra Karabatić; skarabat@kbc-zagreb.hr

INTRODUCTION

According to official data from the Croatian Institute of Public Health for 2022, the number of newly diagnosed cases of tracheal, bronchial, and lung cancer was 2,392 (17%) among men and 1,275 (10%) among women (1).

According to recent literature, oncological treatment includes surgical procedures for diagnosis and radical tumor resection, radiotherapy for local disease control, and systemic therapies such as chemotherapy, targeted therapy, and immunotherapy, in accordance with the standards of modern oncology (2).

The diagnosis of malignant disease and the initiation of treatment often have a negative impact on patients' quality of life, resulting in numerous physical and psychological consequences (3). Regardless of the treatment modality, every form of oncological therapy is associated with a range of unpleasant physical and psychological adverse effects. Therefore, in addition to factors such as drug toxicity, survival, and tumor response to therapy, quality of life should also be considered when evaluating cancer treatment outcomes. Importantly, quality of life assessment is highly individual, as it depends on patients' personal aspirations, wishes, values, personality traits, and social environment (4).

Compared with other malignancies, patients with lung cancer frequently experience poorer general health status, more pronounced symptoms, and a greater reduction in quality of life (5). Lung cancer adversely affects quality of life not only because of the disease itself, but also due to treatment-related adverse events. In advanced stages of the disease, symptoms such as dyspnea, fatigue, loss of appetite, and pain further contribute to impaired quality of life (6). Although health-related quality of life in patients with lung cancer is often substantially compromised, it remains underrecognized and insufficiently managed in clinical practice (7). Therefore, alleviating factors that negatively affect quality of life in these patients remains a major clinical challenge.

Aim: To assess the impact of different systemic treatment modalities on the quality of life of patients with lung cancer.

PARTICIPANTS AND METHODS

A cross-sectional study was conducted at the Clinic for Pulmonary Diseases Jordanovac, University Hospital Centre Zagreb, between January and June 2022. The study included patients diagnosed with lung cancer who were receiving chemotherapy, immunotherapy, targeted therapy, or combined therapy following surgical treatment. The sample consisted of 162 participants.

The study was conducted using the EORTC QLQ-C30 questionnaire, version 3.0. The Croatian version of the questionnaire, which demonstrated good psychometric properties in this sample, was used. The questionnaire consists of five functioning scales: physical, role, cognitive, emotional, and social functioning, as well as three symptom scales: fatigue, pain, and nausea/vomiting. It also includes scales assessing global health status and quality of life, together with six additional symptom items related to malignant disease: dyspnea, appetite loss, sleep disturbances, constipation, diarrhea, and financial difficulties caused by the disease. The questionnaire comprises 30 items in total. Twenty-eight items are scored on a four-point Likert scale ranging from 1 ("not at all") to 4 ("very much"), while the final two items assessing subjective global health status and quality of life are scored on a seven-point Likert scale ranging from 1 ("very poor") to 7 ("excellent") (8,9).

Before completing the questionnaire, participants read the informed consent form and were given the opportunity to ask questions and receive additional explanations. They then decided whether to participate and signed the consent form. Participants completed the questionnaire at the initiation of their first treatment cycle and repeated it after the second treatment cycle, approximately two months later. The study was conducted following approval by the Ethics Committee of the University Hospital Centre Zagreb. Ethical approval was granted at the 210th regular meeting of the Ethics Committee held on March 14, 2022.

Categorical variables were presented as absolute and relative frequencies. The normality of distribution for numerical variables was assessed using the Shapiro–Wilk test. Since the data were not normally distributed, numerical variables were described using the median and interquartile range. Differences in continuous variables between two independent groups were analyzed using the Mann–Whitney U test, while comparisons among three or more groups were performed using the Kruskal–Wallis test. Changes in quality-of-life domains before treatment and two months after treatment initiation were assessed using the Wilcoxon signed-rank test. Associations between variables were evaluated using Spearman's rank correlation coefficient (Rho). Internal consistency reliability of the scales was assessed using Cronbach's alpha coefficient. All P values were two-sided, and the level of statistical significance was set at $\alpha = 0.05$. Statistical analyses were performed using MedCalc Statistical Software (MedCalc Software Ltd, Ostend, Belgium) and IBM SPSS Statistics (IBM Corp., Armonk, NY, USA) (8, 9).

RESULTS

The study included 162 patients, of whom 106 (65.4%) were men and 56 (34.6%) were women. The median age of the patients was 67 years, ranging from 33 to 84 years (Table 1).

Table 1. *Patients according to baseline characteristics*

Sex [n (%)]	
Male	106 (65.4)
Female	56 (34.6)
Patient age (years) [Median (interquartile range)]	67 (61 – 73)

With regard to treatment modality, most patients received chemotherapy (85; 52.5%), followed by immunotherapy (49; 30.2%). Combined immunotherapy and chemotherapy was administered to 19 patients (11.7%), while a smaller number of patients received targeted therapy or combined chemotherapy and radiotherapy (Figure 1).

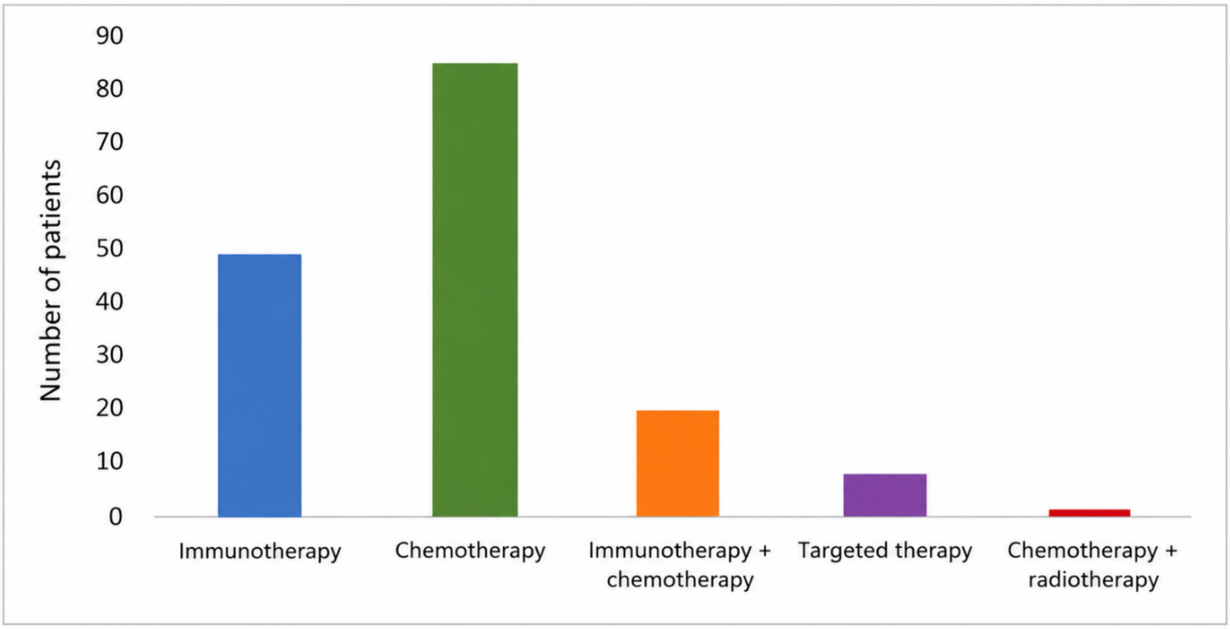

Figure 1. Distribution of patients according to therapy

Patients receiving immunotherapy demonstrated significantly better emotional functioning two months after treatment initiation (Wilcoxon test, P = 0.02), with lower levels of fatigue (Wilcoxon test, P = 0.01), pain (Wilcoxon test, P = 0.02), and sleep disturbances (Wilcoxon test, P = 0.009). The overall symptom scale was also significantly less pronounced (Wilcoxon test, P = 0.03) compared with the period before treatment initiation. No significant differences were observed in other functional domains or symptoms (Table 2).

Table 2. *Quality-of-life assessment before treatment initiation and two months later in patients receiving immunotherapy (n = 49)*

	Median (interquartile range)		
Immunotherapy	Before treatment	After 2 months	*P**
Global health status	50 (41.7 - 75)	62.5 (41.7 – 83.3)	0.24
Physical functioning	66.7 (53.3 – 86.7)	66.7 (53.3 – 86.7)	0.36
Role functioning	66.7 (33.3 - 100)	66.7 (33.3 - 100)	0.84
Emotional functioning	66.7 (52.1 – 91.7)	75 (66.7 – 91.7)	**0.02**
Cognitive functioning	83.3 (66.7 - 100)	83.3 (83.3 - 100)	0.13
Social functioning	66.7 (50 - 100)	83.3 (50 - 100)	0.35
Fatigue	44.4 (25 – 63.9)	33.3 (11.1 – 55.6)	**0.01**
Nausea/vomiting	0 (0 – 16.7)	0 (0 – 16.7)	0.82
Pain	33.3 (0 - 50)	16.7 (0 - 50)	**0.02**
Dyspnea	33.3 (8.3 – 66.7)	33.3 (0 – 66.7)	0.13
Sleep disturbances	44.4 (0 – 66.7)	33.3 (0 – 33.3)	**0.009**
Appetite loss	33.3 (0 – 66.7)	33.3 (0 – 58.3)	0.14
Constipation	0 (0 – 33.3)	0 (0 – 33.3)	0.40
Diarrhea	0 (0 - 0)	0 (0 - 0)	>0.99
Financial difficulties	16.7 (0 – 33.3)	16.7 (0 – 66.7)	0.48
Functioning scale	73.3 (56.1 – 84.4)	73.3 (58.3 – 88.9)	0.19
Symptom scale	25.6 (16 - 43)	24.4 (10.3 – 35.9)	**0.03**

*Wilcoxon test

The results showed that patients receiving chemotherapy had significantly better social functioning two months after treatment initiation (Wilcoxon test, P = 0.04), while financial difficulties were significantly more pronounced (Wilcoxon test, P = 0.01) compared with the period before treatment initiation. No significant differences were observed in other functional domains or symptoms (Table 3).

Table 3. *Quality-of-life assessment before treatment initiation and two months later in patients receiving chemotherapy (n = 85)*

Chemotherapy	Median (interquartile range)		*P**
	Before treatment	After 2 months	
Global health status	50 (33.3 – 66.7)	50 (33.3 – 66.7)	0.40
Physical functioning	60 (43.3 – 83.3)	60 (33.3 - 80)	0.45
Role functioning	50 (33.3 - 100)	50 (33.3 – 83.3)	0.92
Emotional functioning	66.7 (50 – 79.2)	66.7 (41.7 - 75)	0.77
Cognitive functioning	83.3 (50 - 100)	66.7 (50 – 83.3)	0.26
Social functioning	66.7 (33.3 – 91.7)	50 (33.3 – 83.3)	**0.04**
Fatigue	44.4 (33.3 – 66.7)	55.6 (33.3 – 66.7)	0.73
Nausea/vomiting	0 (0 – 16.7)	16.7 (0 – 33.3)	0.09
Pain	33.3 (8.3 – 66.7)	33.3 (16.7 – 66.7)	0.99
Dyspnea	33.3 (33.3 – 66.7)	33.3 (33.3 – 66.7)	0.30
Sleep disturbances	33.3 (0 – 66.7)	33.3 (16.7 – 66.7)	0.71
Appetite loss	33.3 (0 – 66.7)	33.3 (0 – 66.7)	0.67
Constipation	0 (0 – 33.3)	33.3 (0 - 50)	0.16
Diarrhea	0 (0 - 0)	0 (0 – 33.3)	0.06
Financial difficulties	33.3 (0 - 50)	50 (0 – 66.7)	**0.01**
Functioning scale	64.4 (44.4 - 80)	60 (44.4 – 76.7)	0.39
Symptom scale	33.3 (18 – 48.7)	33.3 (20.5 – 48.7)	0.23

*Wilcoxon test

In patients receiving combined therapy, only global health status was rated significantly better two months after treatment initiation (Wilcoxon test, P = 0.04) compared with the period before treatment initiation. No significant differences were observed in other functional domains or symptoms (Table 4).

Table 4. *Quality-of-life assessment before treatment initiation and two months later in patients receiving combined therapy (n = 26)*

Combined therapy + targeted therapy	Median (interquartile range)		*P**
	Before treatment	After 2 months	
Global health status	50 (25 – 77.1)	54.2 (47.9 – 68.8)	**0.04**
Global health status	76.7 (30 – 88.3)	60 (31.7 – 86.7)	0.78
Physical functioning	58.3 (25 – 87.5)	50 (33.3 – 87.5)	0.93
Role functioning	66.7 (50 – 83.3)	66.7 (47.9 – 85.4)	0.24
Emotional functioning	83.3 (50 - 100)	66.7 (50 - 100)	0.55
Cognitive functioning	83.3 (33.3 - 100)	66.7 (33.3 - 100)	0.71
Social functioning	50 (22.2 – 66.7)	44.4 (22.2 – 66.7)	0.32
Fatigue	0 (0 – 16.7)	0 (0 – 16.7)	0.96
Nausea/vomiting	33.3 (0 – 70.8)	33.3 (0 – 54.2)	0.06
Pain	33.3 (25 – 66.7)	33.3 (0 – 66.7)	0.28
Dyspnea	33.3 (0 – 66.7)	33.3 (0 – 66.7)	0.37
Sleep disturbances	16.7 (0 – 33.3)	16.7 (0 – 33.3)	0.32
Appetite loss	0 (0 – 66.7)	33.3 (0 – 66.7)	0.49
Constipation	0 (0 – 8.3)	0 (0 - 0)	0.48
Diarrhea	16.7 (0 – 66.7)	33.3 (0 – 66.7)	0.38
Financial difficulties	70 (41.7 – 87.2)	60 (42.2 – 82.8)	0.89
Functioning scale	28.2 (12.8 – 51.9)	28.2 (12.8 – 46.2)	0.41

*Wilcoxon test

Two months after treatment initiation, emotional functioning (Kruskal–Wallis test, P = 0.002) and social functioning (Kruskal–Wallis test, P = 0.02) were significantly poorer in patients receiving chemotherapy compared with those receiving immunotherapy. Cognitive functioning was significantly better in patients receiving immunotherapy compared with all other patients (chemotherapy or combined therapy) (Kruskal–Wallis test, P = 0.001). Fatigue (Kruskal–Wallis test, P = 0.008) and pain (Kruskal–Wallis test, P = 0.03) were significantly less pronounced in patients receiving immunotherapy compared with patients receiving chemotherapy, whereas nausea/vomiting was significantly more pronounced in patients receiving chemotherapy compared with all other patients (immunotherapy or combined therapy). The overall functioning scale was rated significantly most favorably in patients receiving immunotherapy (Kruskal–Wallis test, P = 0.01), as was the overall symptom burden scale (Kruskal–Wallis test, P = 0.005) (Table 5).

Table 5. *Quality-of-life assessment two months after treatment initiation according to treatment modality*

After 2 months	Median (interquartile range)			*P**
	Immunotherapy	Chemotherapy	Combined therapy + targeted therapy	
Global health status	62.5 (41.7 – 83.3)	50 (33.3 – 66.7)	54.2 (47.9 – 68.8)	0.29
Physical functioning	66.7 (53.3 – 86.7)	60 (33.3 - 80)	60 (31.7 – 86.7)	0.22
Role functioning	66.7 (33.3 - 100)	50 (33.3 – 83.3)	50 (33.3 – 87.5)	0.50
Emotional functioning	75 (66.7 – 91.7)	66.7 (41.7 - 75)	66.7 (47.9 – 85.4)	**0.002**[†]
Cognitive functioning	83.3 (83.3 - 100)	66.7 (50 – 83.3)	66.7 (50 - 100)	**0.001**[‡]
Social functioning	83.3 (50 - 100)	50 (33.3 – 83.3)	66.7 (33.3 - 100)	**0.02**[†]
Fatigue	33.3 (11.1 – 55.6)	55.6 (33.3 – 66.7)	44.4 (22.2 – 66.7)	**0.008**[†]
Nausea/vomiting	0 (0 – 16.7)	16.7 (0 – 33.3)	0 (0 – 16.7)	**0.003**[§]
Pain	16.7 (0 - 50)	33.3 (16.7 – 66.7)	33.3 (0 – 54.2)	**0.03**[†]
Dyspnea	33.3 (0 – 66.7)	33.3 (33.3 – 66.7)	33.3 (0 – 66.7)	0.21
Sleep disturbances	33.3 (0 – 33.3)	33.3 (16.7 – 66.7)	33.3 (0 – 66.7)	0.06
Appetite loss	33.3 (0 – 58.3)	33.3 (0 – 66.7)	16.7 (0 – 33.3)	0,06
Constipation	0 (0 – 33.3)	33.3 (0 - 50)	33.3 (0 – 66.7)	0.11
Diarrhea	0 (0 - 0)	0 (0 – 33.3)	0 (0 - 0)	0.04
Financial difficulties	16.7 (0 – 66.7)	50 (0 – 66.7)	33.3 (0 – 66.7)	0.44
Functioning scale	73.3 (58.3 – 88.9)	60 (44.4 – 76.7)	60 (42.2 – 82.8)	**0.01**[†]
Symptom scale	24.4 (10.3 – 35.9)	33.3 (20.5 – 48.7)	28.2 (12.8 – 46.2)	**0.005**[†]

*Kruskal Wallis test (post hoc Conover)

[†] At the level of $P < 0.05$, the score was significantly lower in patients receiving chemotherapy compared with those receiving immunotherapy.

[‡] At the level of $P < 0.05$, the score was significantly most favorable in patients receiving immunotherapy compared with all other groups.

[§] At the level of $P < 0.05$, the symptom was significantly more pronounced in patients receiving chemotherapy compared with all other groups.

Two months after treatment initiation, a statistically significant association was observed between global health status and all individual quality-of-life domains. The strongest negative correlation was found between global health status and fatigue (Rho = -0.625), indicating that higher levels of fatigue were associated with poorer global health status. At the same time, a positive correlation was identified between global health status and the functioning scale (Rho = 0.635), whereby better functioning was associated with better perceived global health status. Lower symptom burden was also associated with better global health status (Rho = -0.615). Analysis of the relationship between functional domains and symptoms demonstrated that lower overall symptom burden, as well as lower intensity of individual symptoms, was associated with better outcomes across all functioning domains, including physical, role, emotional, cognitive, and social functioning (Table 6).

Table 6. *Interrelationships between quality-of-life scales*

	Spearman's rank correlation coefficient (Rho) (P value)					
After 2 months	Global health status	Functioning				
		Physical	Role	Emotional	Cognitive	Social
Fatigue	-0.625 (<0.001)	-0.708 (<0.001)	-0.661 (<0.001)	-0.546 (<0.001)	-0.545 (<0.001)	-0.607 (<0.001)
Nausea/vomiting						
Pain	-0.302 (<0.001)	-0.314 (<0.001)	-0.248 (<0.001)	-0.485 (<0.001)	-0..2 (<0.001)	-0.408 (<0.001)
Fatigue	-0.486 (<0.001)	-0.538 (<0.001)	-0.526 (<0.001)	-0.501 (<0.001)	-0.463 (<0.001)	-0.53 (<0.001)
Dyspnea	-0.460 (<0.001)	-0.595 (<0.001)	-0.517 (<0.001)	-0.333 (<0.001)	-0.32 (<0.001)	-0.458 (<0.001)
Sleep disturbances	-0.372 (<0.001)	-0.452 (<0.001)	-0.402 (<0.001)	-0.468 (<0.001)	-0.403 (<0.001)	-0.333 (<0.001)
Appetite loss	-0.488 (<0.001)	-0.458 (<0.001)	-0.451 (<0.001)	-0.49 (<0.001)	-0.481 (<0.001)	-0.492 (<0.001)
Constipation	-0.313 (<0.001)	-0.399 (<0.001)	-0.29 (<0.001)	-0.223 (<0.001)	-0.291 (<0.001)	-0.337 (<0.001)
Diarrhea	-0.139 (0.08)	-0.153 (0.06)	-0.156 (0.06)	-0.312 (<0.001)	-0.272 (<0.001)	-0.228 (<0.001)
	-0.199 (0.01)	-0.372 (<0.001)	-0.39 (<0.001)	-0.419 (<0.001)	-0.393 (<0.001)	-0.466 (<0.001)
Financial difficulties and Functioning scale	0.635 (<0.001)	0.848 (<0.001)	0.803 (<0.001)	0.770 (<0.001)	0.722 (<0.001)	0.805 (<0.001)
Symptom scale	-0.615 (<0.001)	-0.729 (<0.001)	-0.682 (<0.001)	-0.646 (<0.001)	-0.620 (<0.001)	-0.689 (<0.001)

DISCUSSION

Quality of life was assessed using a reliable and validated questionnaire that proved suitable for the studied patient sample (8,9). The analysis demonstrated that global health status significantly improved two months after treatment initiation, while no statistically significant changes were observed in other functioning or symptom domains compared with baseline values. Fatigue and dyspnea were more pronounced at the beginning of treatment, whereas both symptoms were significantly reduced two months after therapy initiation (10–12). Financial difficulties were significantly more pronounced after two months of therapy, which is consistent with literature reporting serious financial burden and even personal bankruptcy among patients with lung cancer (13). Among male participants, global health status was significantly better and sleep-related problems were reduced two months after treatment initiation. International studies have shown that patients with lung cancer experience substantially higher levels of stress compared with patients with other malignancies, while untreated stress is associated with poorer quality of life, treatment refusal, dissatisfaction with healthcare services, and reduced life expectancy (14).

Analysis according to treatment modality showed that patients receiving immunotherapy had significantly better emotional functioning, lower levels of fatigue and pain, fewer sleep disturbances, and a significantly lower overall symptom burden two months after treatment initiation compared with baseline values (15). Patients receiving chemotherapy demonstrated significantly improved social functioning, but also more pronounced financial difficulties two months after treatment initiation compared with the period before treatment (16–20).

Patients receiving combined therapy demonstrated a significant improvement only in global health status two months after treatment initiation. Emotional and social functioning were significantly poorer in patients receiving chemotherapy compared with those receiving immunotherapy. Cognitive functioning was rated most favorably among patients receiving immunotherapy compared with all other treatment groups (21–23). Fatigue was significantly less pronounced in patients receiving immunotherapy compared with those receiving chemotherapy, whereas nausea and vomiting were more pronounced in patients receiving chemotherapy than in all other groups. Global health status was significantly associated with all individual domains, with the strongest association observed for fatigue (24–28). In addition to fatigue and dyspnea, chemotherapy-induced nausea and vomiting also have a substantial impact on patients' quality of life. Studies have shown that chemotherapy-induced nausea and vomiting (CINV) not only impair physical functioning, but also strongly affect patients' emotional and social well-being. In their analysis, Yeo et al. demonstrated that nausea is associated with persistent reductions in quality of life, while Salihah et al. emphasized the importance of patients' subjective experiences, as many patients report a loss of control over daily life. Widgren et al. further highlighted that expectations regarding treatment and the quality of communication with healthcare professionals may significantly influence the perception and burden of CINV (29–31).

The findings additionally emphasize the importance of continuous monitoring of quality of life in patients undergoing treatment for lung cancer. Monitoring functional domains, symptoms, and global health status enables timely recognition of problems that may negatively affect daily functioning, emotional well-being, and social participation. The implementation of a standardized quality-of-life questionnaire into nursing documentation is both justified and necessary. Regular patient monitoring using validated instruments allows nursing interventions to be more targeted, individualized, and effective, thereby contributing to a holistic approach to care and confirming the importance of integrating non-pharmacological interventions into routine clinical practice (32–35). Although the study findings provide valuable insight into the quality of life of patients with lung cancer, several limitations should be considered. First, the sample size was relatively small and derived from a single clinical center, which may limit the generalizability of the findings to the broader population. Second, the follow-up period lasted only two months, which may be insufficient to detect long-term changes in quality of life associated with different treatment modalities. Third, quality-of-life assessment was based exclusively on self-reported questionnaires, which may be influenced by patients' subjective perceptions and their current psychological and physical condition. Future studies should therefore include larger and more heterogeneous samples with longer follow-up periods to evaluate chronic and delayed effects of treatment on quality of life. In addition, combining subjective questionnaires with objective indicators of health status, such as biomarkers or clinical parameters, may provide a more comprehensive assessment.

Further research should also investigate the impact of additional non-pharmacological interventions, including psychosocial support and rehabilitation programs, on improving patients' functional and emotional well-being.

CONCLUSION

Both treatment modality and the two-month course of treatment significantly influenced the quality of life of patients with lung cancer. Better quality of life across all domains was observed in patients receiving immunotherapy. The integration of quality-of-life assessment into routine clinical practice is justified and essential, while future research should focus on the development and implementation of interventions aimed at reducing symptom burden, improving emotional and social functioning, and alleviating patients' financial burden.

GENERATIVE AI STATEMENT

During the preparation of this manuscript, ChatGPT Plus (OpenAI) was used for language translation and improvement of scientific writing style in English. All generated content was critically reviewed, edited, and approved by the authors, who take full responsibility for the integrity, accuracy, and originality of the manuscript.

LITERATURE

1. Registar za rak Republike Hrvatske. Incidencija raka u Hrvatskoj. Zagreb: Hrvatski zavod za javno zdravstvo; 2022. Dostupno na: https://www.hzjz.hr/tag/registar-za-rak/ Accessed: 26 May 2025.
2. Eskandar K. Therapeutic breakthroughs in oncology: Enhancing treatment and management. Can Oncol Nurs J. 2025. 1;35(4):590-605.
3. Prapa P, Papathanasiou IV, Bakalis V, Malli F, Papagiannis D, Fradelos EC. Quality of Life and Psychological Distress of Lung Cancer Patients Undergoing Chemotherapy. World J Oncol. 2021 Jun;12(2-3):61-66.
4. Hunt A, Martyr A, Gamble LD, Morris RG, Thom JM, Pentecost C, Clare L. The associations between personality traits and quality of life, satisfaction with life, and well-being over time in people with dementia and their caregivers: findings from the IDEAL programme. BMC Geriatr. 2023 Jun 6;23(1):354.
5. Hechtner M, Eichler M, Wehler B, Buhl R, Sebastian M, Stratmann J, i sur. Quality of Life in NSCLC Survivors - A Multicenter Cross-Sectional Study. J Thorac Oncol. 2019 Mar;14(3):420-35.
6. Majem M, Basch E, Cella D, Garon EB, Herbst RS, Leighl NB. Understanding health-related quality of life measures used in early-stage non-small cell lung cancer clinical trials: A review. Lung Cancer. 2024 Jan;187:107419.
7. Joshy G, Thandrayen J, Koczwara B, Butow P, Laidsaar-Powell R, Rankin N, i sur. Disability, psychological distress and quality of life in relation to cancer diagnosis and cancer type: population-based Australian study of 22,505 cancer survivors and 244,000 people without cancer. BMC Med. 2020 Dec 1;18(1):372.
8. Fayers PM, Aaronson NK, Bjordal K, Groenvold M, Curran D, Bottomley A, i sur. The EORTC QLQ-C30 Scoring Manual. 3rd ed. Brussels: European Organisation for Research and Treatment of Cancer; 2001.
9. Pinjatela R. Neke karakteristike kvalitete života osoba sa i bez malignog oboljenja. Hrvatska revija za rehabilitacijska istraživanja. 2008;44:79-98.

10. Vlaski T, Slavic M, Caspari R, Bilsing B, Fischer H, Brenner H, Schöttker B. From a clustering of adverse symptoms after colorectal cancer therapy to chronic fatigue and low ability to work: a cohort study analysis with 3 months of follow-up. Cancers (Basel). 2024 Jan 1;16(1):202.
11. Lorca LA, Ribeiro IL, Pizarro M, Rebolledo Rebolledo G. Prevalence of cancer-related fatigue syndrome and its association with sociodemographic and clinical characteristics in adult patients with colorectal cancer: a cross-sectional study. Support Care Cancer. 2024 Nov 22;32(12):814.
12. Chayadi E, Baes N, Kiropoulos L. The effects of mindfulness-based interventions on symptoms of depression, anxiety, and cancer-related fatigue in oncology patients: a systematic review and meta-analysis. PLoS One. 2022 Jul 14;17(7):e0269519. doi:10.1371/journal.pone.0269519.
13. Barbaret C, Brosse C, Rhondali W, Ruer M, Monsarrat L, Michaud P, i sur. Financial distress in patients with advanced cancer. PLoS One. 2017 May 18;12(5):e0176470. doi:10.1371/journal.pone.0176470.
14. Jafri SH, Ali F, Mollaeian A, Mojiz Hasan S, Hussain R, Akkanti B, i sur. Major stressful life events and risk of developing lung cancer: a case-control study. Clin Med Insights Oncol. 2019 May 1;13:1179554919835798.
15. Pandjarova I, Mercieca D, Gijtenbeek RGP, Pereira JO, Fantin A, Castaldo N, i sur. Small cell lung cancer and neuroendocrine tumours. Breathe (Sheff). 2024 Nov 12;20(3):240004.
16. Hann CL, Wu MA, Rekhtman N, Rudin CM. Small cell and neuroendocrine tumors of the lung. In: DeVita VT, Lawrence TS, Rosenberg SA, ur. Cancer: Principles & Practice of Oncology. Wolters Kluwer Health Pharma Solutions (Europe) Ltd; 2018. p. 671-700.
17. Smith GL, Banegas MP, Acquati C, Chang S, Chino F, Conti RM, i sur. Navigating financial toxicity in patients with cancer: a multidisciplinary management approach. CA Cancer J Clin. 2022 Sep;72(5):437-53.
18. Smith GL, Lopez-Olivo MA, Advani PG, Ning MS, Geng Y, Giordano SH, Volk RJ. Financial burdens of cancer treatment: a systematic review of risk factors and outcomes. J Natl Compr Canc Netw. 2019 Oct 1;17(10):1184-92.
19. Xu B, Hu L, Cheng Q, So KW. A systematic review of financial toxicity among cancer patients in China. Asia Pac J Oncol Nurs. 2022 Apr 27;9(8):100071.
20. Liu L, Cao Y, Su M, Zhang J, Miao Y, Yao N. Financial toxicity among older cancer survivors in China: a qualitative study of oncology providers' perceptions and practices. Support Care Cancer. 2022 Nov;30(11):9433-40.
21. Antoni MH, Moreno PI, Penedo FJ. Stress management interventions to facilitate psychological and physiological adaptation and optimal health outcomes in cancer patients and survivors. Annu Rev Psychol. 2023 Jan 18;74:423-55.
22. Barre PV, Padmaja G, Rana S, Tiamongla. Stress and quality of life in cancer patients: medical and psychological intervention. Indian J Psychol Med. 2018 May-Jun;40(3):232-38.
23. Dehghan M, Jazinizade M, Malakoutikhah A, Madadimahani A, Iranmanesh MH, Oghabian S, i sur. Stress and quality of life of patients with cancer: the mediating role of mindfulness. J Oncol. 2020 Dec 10;2020:3289521.

24. Al Maqbali M. Cancer-related fatigue: an overview. Br J Nurs. 2021 Feb 25;30(4):S36-S43.
25. Akbas M, Surucu SG, Akca E, Koroglu CO. Determination of the relationship between the fatigue and social support levels of cancer patients: a cross-sectional study. Korean J Intern Med. 2021 Mar;36(Suppl 1):S207-S16.
26. Liu D, Weng JS, Ke X, Wu XY, Huang ST. The relationship between cancer-related fatigue, quality of life and pain among cancer patients. Int J Nurs Sci. 2022 Dec 21;10(1):111-16.
27. Xu J, Li Q, Gao Z, Ji P, Ji Q, Song M, i sur. Impact of cancer-related fatigue on quality of life in patients with cancer: multiple mediating roles of psychological coherence and stigma. BMC Cancer. 2025 Jan 10;25(1):64.
28. Jones JM, Howell D, Longo C, Olson K, Bedard P, Amir E, i sur. The association of cancer-related fatigue on the social, vocational and healthcare-related dimensions of cancer survivorship. J Cancer Surviv. 2025 Feb;19(1):97-108.
29. Yeo W, Mo FKF, Yip CCH, Yeo VA, Li L, Lau TKH, i sur. Quality of life associated with nausea and vomiting from anthracycline-based chemotherapy: a pooled data analysis from three prospective trials. Oncologist. 2021 Dec;26(12):e2288-e2296.
30. Salihah N, Mazlan N, Lua PL. Chemotherapy-induced nausea and vomiting: exploring patients' subjective experience. J Multidiscip Healthc. 2016 Apr 4;9:145-51.
31. Widgren Y, Silén M, Wåhlin I, Lindberg M, Fransson P, Efverman A. Chemotherapy-induced emesis: experienced burden in life, and significance of treatment expectations and communication in chemotherapy care. Integr Cancer Ther. 2023;22:15347354231217296.
32. Snyder CF, Jensen RE, Segal JB, Wu AW. Patient-reported outcomes (PROs): putting the patient perspective in patient-centered outcomes research. Med Care. 2013 Aug;51(8 Suppl 3):S73-S79.
33. Giesinger JM, Wintner LM, Zabernigg A, Gamper EM, Oberguggenberger AS, i sur. Assessing quality of life in patients with cancer: a review of available instruments. Support Care Cancer. 2009 Jun;17(6):681-90.
34. Wintner LM, Giesinger JM, Zabernigg A, Rumpold G, Sztankay M, i sur. Quality of life during chemotherapy in lung cancer patients: results across different treatment lines. Br J Cancer. 2016 Jan 5;114(1):8-14.
35. Buiting HM, Terpstra W, Dalhuisen F, Gunnink-Boonstra N, Sonke GS, Dalesio O, de Haes H. The facilitating role of quality of life assessment in oncology practice: an experiment with an overview chart. Support Care Cancer. 2020 Mar;28(3):1121-31.

KVALITETA ŽIVOTA POVEZANA SA ZDRAVLJEM MEĐU BOLESNICIMA S RAKOM PLUĆA OVISNO O VRSTI LIJEČENJA

Sandra Karabatić[1,2,6], Ilda Bećirević[3], Božica Lovrić[4,5,6], Tihomir Jovanović[5,7,8]
[1]Klinički bolnički centar Zagreb, Kišpatićeva 12, 10 000 Zagreb, Hrvatska
[2]Hrvatsko katoličko sveučilište, Ilica 244, 10 000 Zagreb, Hrvatska
[3]Poliklinika Rotim, Miramarska cesta 24, 10 000 Zagreb, Hrvatska
[4]Opća županijska bolnica Požega, Osječka 107, 34 000 Požega, Hrvatska
[5]Fakultet za dentalnu medicinu i zdravstvo, Sveučilište Josipa Jurja Strossmayera u Osijeku, Crkvena 21, 31 000 Osijek, Hrvatska
[6]Veleučilište Ivanić-Grad, Moslavačka 11, 10 310 Ivanić-Grad, Hrvatska
[7]Opća županijska bolnica Pakrac i bolnica hrvatskih veterana, Bolnička 74, 34 550 Pakrac, Hrvatska
[8]Medicinski fakultet, Sveučilište Josipa Jurja Strossmayera u Osijeku, Josipa Huttlera 4, 31 000 Osijek, Hrvatska

SAŽETAK

Uvod: Rak pluća i dalje je jedan od vodećih uzroka pobola i smrtnosti povezanih sa zloćudnim bolestima u svijetu, dok je kvaliteta života postala važan pokazatelj ishoda suvremenog onkološkog liječenja.

Cilj: Procijeniti utjecaj različitih modaliteta sustavnog liječenja na kvalitetu života bolesnika s rakom pluća.

Metode: Ovo prospektivno istraživanje provedeno je od siječnja do lipnja 2022. godine u Odjelu za tumore pluća i sredoprsja, Klinike za plućne bolesti Jordanovac, Kliničkog bolničkog centra Zagreb, Hrvatska. Uključena su ukupno 162 bolesnika liječena kemoterapijom, imunoterapijom, ciljanom terapijom ili kombiniranom terapijom nakon kirurškog zahvata. Kvaliteta života procijenjena je pomoću upitnika EORTC QLQ-C30 pri početku liječenja i dva mjeseca nakon započinjanja terapije. U statističkoj obradi korišteni su Wilcoxonov test predznaka rangova i Kruskal–Wallisov test.

Rezultati: Opće zdravstveno stanje značajno se poboljšalo dva mjeseca nakon početka liječenja ($P = 0,03$), dok su umor ($P = 0,04$) i dispneja ($P = 0,04$) bili manje izraženi u odnosu na početne vrijednosti. Financijske poteškoće značajno su porasle tijekom liječenja ($P = 0,009$). Bolesnici liječeni kemoterapijom imali su značajno lošije emocionalno ($P = 0,002$) i socijalno funkcioniranje ($P = 0,02$) u usporedbi s bolesnicima na imunoterapiji. Kognitivno funkcioniranje bilo je značajno bolje u bolesnika liječenih imunoterapijom nego u bolesnika na kemoterapiji ili kombiniranoj terapiji ($P = 0,001$). Ukupno funkcioniranje ($P = 0,01$) i opterećenje simptomima ($P = 0,005$) bili su najpovoljniji u skupini bolesnika liječenih imunoterapijom.

Zaključak: Modalitet liječenja značajno utječe na kvalitetu života bolesnika s rakom pluća, pri čemu imunoterapija pokazuje najpovoljnije funkcionalne i simptomatske ishode.

Ključne riječi: rak pluća, kvaliteta života, imunoterapija, kemoterapija, ciljana terapija.

Autor za korespondenciju: Sandra Karabatić; skarabat@kbc-zagreb.hr