

# Assessment of Quality of Life of Cancer Patients Due to Radiation Therapy - A Prospective Observational Study

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## ABSTRACT

**Background:** Quality of Life (QOL) assessment is essential in cancer care, particularly for patients undergoing Radiotherapy (RT), which is administered to nearly 50% of all cancer patients. While RT improves survival, it often causes side effects impacting physical, emotional, social, and functional well-being. Existing literature shows varied QOL outcomes, underlining the need for ongoing evaluation and tailored supportive care. **Objectives:** To assess QOL changes in cancer patients receiving RT and explore influencing factors, with a focus on physical, emotional, social, and functional domains. **Materials and Methods:** A prospective observational study was conducted over six months (August 2024-January 2025) at a tertiary cancer hospital in Belagavi, India. A total of 93 adult cancer patients undergoing RT were evaluated using the Functional Assessment of Cancer Therapy-General (FACT-G) questionnaire. Clinical pharmacists monitored RT parameters (type, dose, duration) and provided supportive care. Statistical analyses included paired-sample *t*-tests and Pearson correlation.

**Keywords:** Quality of Life, Cancer, Radiotherapy, FACT-G, Emotional Well-being.

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## INTRODUCTION

Recently, more attention is being given to Quality of Life (QOL) in cancer recovery and survivorship care. In cancer studies, Quality of Life (QOL) and Health-Related Quality of Life (HRQOL) are often used similarly. QOL, as per the NCI, means overall life enjoyment and daily functioning. The CDC defines HRQOL as how people see their physical and mental health over time. Cancer patients often face drops in Quality of Life (QoL), which is usually measured through questionnaires. However, QoL can change over time as patients adjust to their condition. This change, called a response shift, can happen due to changes in how they view, value, or understand their health.

Cancer cases are rising worldwide, and better treatments are helping patients live longer. While cancer trials often focus on survival and tumour control, Quality of Life (QOL) is just as important. In recent decades, researchers have used different methods to study how treatments affect patients' daily well-being and overall health.

The FACT-G is a helpful tool to assess if cancer survivors need extra support based on their overall and specific QOL scores. A study by Taira *et al.* found that breast cancer survivors improved in physical, emotional, and functional well-being over time, but their social well-being dropped. This highlights the need for focused support to improve social health and overall QOL. Early identification of HRQOL issues can improve satisfaction, outcomes, and reduce healthcare costs. This study examined how Radiotherapy (RT), used in half of cancer cases, affects QOL and what factors play a role.

## MATERIALS AND METHODS

This longitudinal observational research with a prospective approach was performed over six months. (Aug 2024 to Jan 2025) in a Cancer Hospital and Medical Research Centre, Belagavi. Ethical approval was granted by the IRB & each participant provided informed written consent

The study included cancer patients undergoing radiotherapy. Clinical pharmacists conducted daily monitoring to assess "Radiation-Related Quality of Life (RRQoL)" outcomes, which were confirmed by radiation oncologists. These QoL outcomes were documented, coded using international medical terminology, and evaluated using validated QoL assessment tools such as the FACT-G. Additionally, clinical pharmacists provided recommendations for supportive measures to improve QoL.



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Information collected included the type of cancer, type, duration, and dose of radiation therapy. However, data on the specific contributors to QoL changes, their clinical significance, and the long-term impact on daily functioning were not explicitly recorded. Clinical pharmacists also monitored whether identified QoL concerns were addressed by radiation oncologists. When unaddressed QoL impairments were identified, pharmacists intervened by collaborating with oncologists to initiate supportive care strategies, including symptom management, nutritional support, and psychological counselling Figure 1.

## RESULTS

A total of 93 cancer patients participated in the study. The largest proportion (51.61%) were between 35 and 60 years old, followed by those over 60 years (45.16%). Males accounted for 69.9% of the participants, while females comprised 30.1%. The majority (64.5%) financed their treatment through self-payment or insurance, whereas 35.4% received support from government schemes. In terms of occupation, 31.18% were professionals, 25.8% were employed, 18.27% were unemployed, 16.12% were housewives, and 8.6% belonged to other categories. Most participants (72.04%) were married, while 27.95% were single. Stage 1 cancer was the most prevalent, affecting 58.06% of patients, followed by Stage 2 at 22.58% and Stage 3 at 9.67%. A smaller proportion had Stage 0 (6.45%) or Stage 4 cancer (3.22%). Head and neck cancer was the most common type (43.01%), followed by breast cancer (17.2%) and oesophageal cancer (13.9%). Among radiation therapy techniques, IMRT was the most widely used (45.16%), followed by VMAT (32.25%), SBRT (12.9%), and SRS (6.45%). In terms of radiation therapy machines, TrueBeam was utilized most frequently (55.91%), with Halcyon being the second most common (44.08%) (Table 1).

This analysis evaluates changes in total well-being scores across different domains before and after treatment, offering insights into the overall effects of radiation therapy on patients' physical, social, emotional, and functional well-being.

### Physical Well-being (PW)

The average pre-treatment score was 22.2688, rising slightly to 22.6129 post-treatment. However, this change was not statistically significant ( $p=0.597$ ), indicating that radiation therapy had no substantial effect on overall physical health. While individual aspects fluctuated, the total score suggests that patients neither significantly improved nor worsened physically.

### Social Well-being (SW)

The mean score increased significantly from 23.2043 to 25.4194 ( $p=0.001$ ), suggesting a meaningful improvement. This indicates that post-treatment, patients felt more socially engaged and supported, potentially due to increased interactions with

healthcare providers, family, or support groups, or a greater receptiveness to social connections.

### Emotional Well-being (EW)

The mean score declined from 20.9140 to 19.7742, suggesting a deterioration in emotional well-being. However, with a  $p$ -value of 0.101, this change is not statistically significant. This implies that while some patients may have experienced heightened emotional distress or anxiety, the overall trend was not strong enough to confirm a widespread decline.

### Functional Well-being (FW)

The average score slightly decreased from 18.6989 to 18.2151, but this change was also not statistically significant ( $p=0.494$ ). This suggests that patients' ability to carry out daily tasks remained largely stable, meaning radiation therapy did not significantly impact functional capacity.

### Overall Interpretation

- Social well-being showed a significant improvement, indicating increased social support and engagement post-treatment.
- Physical and functional well-being remained largely unchanged, suggesting that radiation therapy did not notably affect overall physical health or daily functioning.
- Emotional well-being declined, but the change was not statistically significant, meaning that while some patients experienced distress, it was not a consistent trend across the group (Table 2).
- Social well-being (SW) demonstrated notable enhancements, particularly in SW3, SW5, and SW6 ( $p=0.041$ ,  $p=0.0001$ ,  $p=0.0001$ ). This implies that post-treatment, patients may have benefited from increased social support, stronger connections, or improved social interactions. However, other dimensions of social well-being remained largely unchanged (Table 3).
- Conversely, Emotional Well-being (EW) declined, especially in EW1 and EW5 ( $p=0.000$ ,  $p=0.005$ ), indicating heightened emotional distress, anxiety, or negative emotions after treatment. The absence of significant changes in other emotional well-being measures suggests that emotional recovery was inconsistent across different aspects.
- The findings for Functional Well-being (FW) were mixed, with most aspects remaining stable. However, FW5 significantly deteriorated ( $p=0.001$ ), suggesting a

decline in patients' ability to carry out daily activities or maintain their usual level of functioning post-treatment.

- In summary, these results indicate that while patients experienced improvements in social interactions and support, they also faced increased emotional distress and some decline in functional capacity. This underscores the importance of psychosocial support and rehabilitation programs to help patients navigate the emotional and functional challenges associated with radiation therapy (Table 3).

### Physical Well-being (PW)

- Higher Pre-RT correlations suggest greater consistency in physical well-being before treatment, while Post Radiation Therapy (RT) correlations weakened, indicating increased variability in physical experiences after treatment (Table 4).

FACT-G function assessment of cancer therapy-general, Physical well-being Question -1(PWQ1), Social well-being Question-1(SWQ1), Emotional well-being Question-1(EWQ1), FW functional well-being Question-1(FWQ1).

- PW Q3 ( $R=0.710$  pre-RT) and PW Q6 ( $R=0.717$  pre-RT) had the highest pre-treatment correlations, reflecting strong consistency in physical health responses before therapy.
- Post-RT correlations declined, especially for PW Q3 ( $R=0.371$ ), highlighting increased variability in physical experiences post-treatment.
- Physical well-being was more stable before treatment but became more variable post-treatment, likely due to individual differences in treatment effects.

### Social Well-being (SW)

- All Pre-RT and Post-RT correlations were statistically significant ( $p=0.0001$  or  $0.001$ ), indicating that pre-treatment social well-being strongly influenced post-treatment perceptions.
- SW Q1, SW Q3, and SW Q7 showed an increase in  $R$  values post-RT, suggesting that patients' perceptions of social support became more consistent over time.
- SW Q4 saw a decline in correlation ( $0.606$  pre-RT to  $0.326$  post-RT), implying that treatment may have influenced social perceptions differently for some patients.
- Social well-being showed increased post-treatment consistency in some areas (SW Q1, SW Q3, SW Q7), suggesting stronger perceptions of social support over time.

### Emotional Well-being (EW)

- Emotional well-being correlations remained strong pre- and post-RT ( $R=0.663$  to  $0.827$  pre-RT, and  $0.557$  to  $0.796$  post-RT), indicating stable emotional responses throughout treatment.
- EW Q1 dropped significantly ( $R=0.816$  pre-RT to  $R=0.557$  post-RT), suggesting increased emotional variability after treatment.
- EW Q5 had the highest correlation both pre- and post-RT ( $0.827$  and  $0.796$ ), indicating consistent emotional responses, possibly tied to a persistent emotional challenge.



**Figure 1:** Study methodology flow chart.

- Emotional well-being remained highly correlated across treatment, but certain aspects (EW Q1) became more variable post-treatment.

### Functional Well-being (FW)

❖ Pre-RT and Post-RT correlations were strong (R values from 0.344 to 0.854,  $p < 0.0001$ ), meaning functional well-being remained highly stable over time.

❖ FW Q2 had the highest post-RT correlation ( $R=0.854$ ), suggesting that patients' post-treatment functional well-being strongly aligned with their pre-treatment state.

❖ FW Q7 had the lowest correlation pre-RT ( $R=0.344$ ) but increased post-RT ( $R=0.515$ ), indicating that patients' views on this functional aspect became more aligned after treatment.

❖ Functional well-being remained stable, with FW Q2 showing the strongest post-treatment correlation ( $R=0.854$ ), reflecting a strong link between pre- and post-treatment functional experiences (Table 4).

❖ Graph - Correlation Between Total Physical & Emotional Wellbeing.

This scatter plot illustrates the relationship between total Physical Wellbeing (Post PW) and Emotional Wellbeing (Post EW) in cancer patients following radiation therapy. Each point represents an individual patient's scores on these two measures.

1. **Positive Relationship:** The dotted trendline indicates a weak to moderate positive correlation, implying that as physical wellbeing improves, emotional wellbeing also tends to increase-though the relationship isn't strictly linear.
2. **Concentration of Data:** A majority of the points are concentrated within the range of Post PW scores from 15 to 30 and Post EW scores from 10 to 25, suggesting that most patients fall within this middle range.
3. **Individual Differences:** The spread of the data shows significant variability. While there's an overall upward trend, some patients with low physical wellbeing report higher emotional wellbeing, and vice versa.
4. **Possible Interpretation:** The findings suggest that enhancing physical wellbeing after radiation therapy may support emotional health, although additional factors likely play a role in shaping emotional outcomes Figure 2.

## DISCUSSION

Our study's findings partially align with those of Basinga *et al.*, who evaluated the impact of Performance-Based Financing (PBF) in Rwanda. While they reported that PBF did not notably lower illness prevalence among children under five, it did enhance health-seeking behaviors and treatment rates for conditions like diarrhoea and fever. Similarly, our results indicate

that PBF can improve the utilization of health services. However, unlike Basinga *et al.*'s focus on patient-level outcomes, our study

**Table 1: Demographic details (N=93).**

Characteristics	Category	Frequency (%)
Age	0-18	1(1.08%)
	19-35	2(2.15%)
	35-60	48(51.61%)
	Above 60	42(45.16%)
Gender	Male	65(69.9%)
	Female	28(30.1%)
Payment Scheme	Self-payment/ insurance	60(64.5%)
	Govt. schemes	33(35.4%)
Occupation	Professional	29(31.18%)
	employed	24(25.8%)
	Unemployed	17(18.27%)
	Housewife	15(16.12%)
	Others	8(8.6%)
Marital Status	Single	26(27.95%)
	Married	67(72.04%)
Stages of Cancer	Stage 0	6(6.45%)
	Stage 1	54(58.06%)
	Stage 2	21(22.58%)
	Stage 3	9(9.67%)
	Stage 4	3(3.22%)
Type of Cancer	Head & Neck	40(43.01%)
	Breast cancer	16(17.20%)
	Oesophageal cancer	13(13.9%)
	Cervical cancer	6(6.45%)
	Malignant neoplasm cancer	5(5.3%)
	Maxilla	6(6.45%)
	Others cancer	7(4.3%)
Type of Radiation therapy	(IMRT) - Intensity Modulated Arc Therapy.	42(45.16%)
	(VMAT) - Volumetric modulated arc therapy.	30(32.25%)
	(SBRT) - Stereotactic Body Radiation Therapy.	12(12.9%)
	(SRS) - stereotactic radiosurgery.	6(6.45%)
	Others	3(3.22%)

**Table 2: Total Paired Sample test of every domain.**

Sl. No.	Pair	Mean	Standard Deviation (SD)	Mean Deviation (MD)	T value	p value
1	Pre PW	22.2688	4.95225	-0.34409	-0.531	0.597
	Post PW	22.6129	3.09639			
2	Pre SW	23.2043	4.03668	-2.21505	-3.910	0.001
	Post SW	25.4194	3.46198			
3	Pre EW	20.9140	4.63366	1.13978	1.654	0.101
	Post EW	19.7742	3.89852			
4	Pre FW	18.6989	5.00388	0.48387	0.687	0.494

**Table 3: Physical Well-being, Social Well-being, Emotional Well-being, Functional Well-being question paired with pre and post Radiation therapy.**

Sl. No.	Pair	Mean	Standard Deviation (SD)	Mean Deviation (MD)	T value	p value
1	Pre PW Q1	3.1613	1.10621	0.26882	1.715	0.090
	Post PW Q1	2.8925	0.98314			
2	Pre PW Q2	2.3333	1.28818	-0.30108	-1.777	0.079
	Post PW Q2	2.6344	1.06102			
3	Pre PW Q3	3.6667	1.07676	0.03226	0.223	0.824
	Post PW Q3	3.6344	0.90632			
4	Pre PW Q4	3.5376	1.11861	0.18280	1.227	0.223
	Post PW Q4	3.3548	0.81621			
5	Pre PW Q5	3.1505	0.97742	-0.01075	-0.086	0.932
	Post PW Q5	3.1613	0.87589			
6	Pre PW Q6	3.2366	0.97130	-0.10753	-0.735	0.464
	Post PW Q6	3.3441	0.86596			
7	Pre PW Q7	3.1828	1.13201	-0.40860	-2.696	0.008
	Post PW Q7	3.5914	0.86271			
Social Well-being						
1	Pre SW Q1	3.667	0.93638	-0.24731	-1.860	0.066
	Post SW Q1	3.9140	0.96297			
2	Pre SW Q2	4.0323	0.87789	-0.20430	-1.626	0.107
	Post SW Q2	4.2366	0.79943			
3	Pre SW Q3	3.9462	0.85167	-0.24731	-2.077	0.041
	Post SW Q3	4.1935	0.76978			
4	Pre SW Q4	3.6667	0.94792	-0.10753	-0.863	0.391
	Post SW Q4	3.7742	0.73911			
5	Pre SW Q5	3.4194	1.03549	-0.53763	-4.045	0.0001
	Post SW Q5	3.9570	0.79282			
6	Pre SW Q6	3.2796	1.33812	-0.80645	-5.294	0.0001
	Post SW Q6	4.0860	0.76123			
7	Pre SW Q7	1.1935	1.71476	-0.06452	-0.269	0.789
	Post SW Q7	1.2581	1.82318			



Emotional Well-being						
1	Pre EW Q1	3.3441	0.99449	0.46237	3.626	0.000
	Post EW Q1	2.8817	0.76399			
2	Pre EW Q2	3.3763	0.96587	-0.03226	-0.215	0.830
	Post EW Q2	3.4086	0.87522			
3	Pre EW Q3	3.3118	1.09325	0.00001	0.000	1.000
	Post EW Q3	3.3118	0.96660			
4	Pre EW Q4	3.5376	1.05870	0.20430	1.326	0.188
	Post EW Q4	3.3333	0.93638			
5	Pre EW Q5	3.5484	1.12787	0.54839	2.885	0.005
	Post EW Q5	3.0000	1.32698			
6	Pre EW Q6	3.7312	0.94570	-0.08602	-0.694	0.489
	Post EW Q6	3.8172	0.859.5			
Functional Well-being						
1	Pre FW Q1	2.4946	1.15743	0.05376	0.362	0.718
	Post FW Q1	2.4409	0.96078			
2	Pre FW Q2	2.2581	1.25891	-0.11828	-0.687	0.494
	Post FW Q2	2.3763	1.17874			
3	Pre FW Q3	2.0430	1.20609	0.0000	0.000	1.000
	Post FW Q3	2.0430	1.05206			
4	Pre FW Q4	3.0968	1.14269	-0.15054	-0.907	0.367
	Post FW Q4	3.2473	1.04939			
5	Pre FW Q5	3.1075	1.21996	0.58065	3.552	0.001
	Post FW Q5	2.5269	1.07937			
6	Pre FW Q6	2.6774	1.20832	0.11828	0.784	0.456
	Post FW Q6	2.5591	1.07807			
7	Pre FW Q7	3.0323	0.93775	0.01075	0.088	0.930
	Post FW Q7	3.0215	0.70678			

FACT-G function assessment of cancer therapy-general, Physical well-being Question -1(PWQ1), Social well-being Question-1(SWQ1), Emotional well-being Question-1(EWQ1), FW functional well-being Question-1(FWQ1).

centres on the influence of health worker motivation as a critical factor in driving PBF performance. This perspective is echoed by Renmans *et al.*, who noted that PBF can affect motivation in complex ways-boosting adherence to incentivized tasks while potentially sidelining non-incentivized duties. Thus, while Basinga *et al.* highlight the downstream impacts of PBF on health outcomes, our work adds to the understanding of upstream behavioural mechanisms, particularly provider motivation, that shape these outcomes. This comparison emphasizes the need for PBF programs to strike a balance between external incentives and intrinsic motivation to achieve lasting improvements in healthcare quality and delivery.

The validation of the Bahasa Malaysia version of the FACT-G in our study aligns closely with the objectives of the Colombian validation by Guzmán *et al.*, as both aimed to culturally adapt and assess the psychometric properties of the FACT-G for use

among cancer patients in non-English-speaking settings. Both studies found strong internal consistency across all subscales, supporting the scale's reliability across diverse cultural groups. Regarding structural validity, our study utilized Confirmatory Factor Analysis (CFA) to validate the four-domain structure, whereas the Colombian study conducted both Exploratory and Confirmatory Factor Analyses, allowing for a more nuanced exploration of the instrument's dimensional framework. Importantly, both validations affirmed the centrality of the emotional and functional well-being domains, though each observed subtle cultural variations in how emotional health was interpreted-likely influenced by cultural attitudes toward emotional disclosure and coping strategies. These comparative findings underscore the FACT-G's reliability and flexibility while highlighting the importance of cultural tailoring to maintain conceptual fidelity and ensure meaningful quality-of-life measurement across different populations.

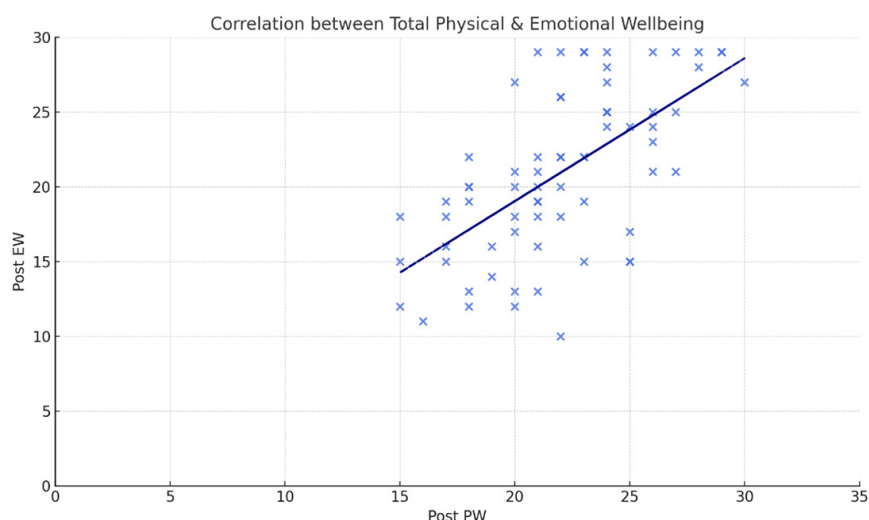
**Table 4: Pearson Correlation Analysis of Total Physical, Social, Emotional, Functional Well-being Questionnaires of Pre & Post RT.**

Physical Wellbeing		Pre Radiation Therapy		Post Radiation Therapy	
Sl. No.	Pair	R value	p value	R value	p value
1	PW Q1	0.619	0.001	0.450	0.001
2	PW Q2	0.66	0.001	0.559	0.001
3	PW Q3	0.710	0.001	0.371	0.001
4	PW Q4	0.598	0.001	0.562	0.001
5	PW Q5	0.575	0.001	0.344	0.001
6	PW Q6	0.717	0.001	0.589	0.001
7	PW Q7	0.703	0.001	0.526	0.001
Social Well-being					
1	SW Q1	0.556	0.0001	0.689	0.0001
2	SW Q2	0.636	0.0001	0.592	0.0001
3	SW Q3	0.515	0.0001	0.687	0.0001
4	SW Q4	0.606	0.0001	0.326	0.001
5	SW Q5	0.611	0.0001	0.498	0.0001
6	SW Q6	0.651	0.0001	0.485	0.0001
7	SW Q7	0.256	0.013	0.434	0.0001
Emotional Well-being					
1	EW Q1	0.816	0.0001	0.557	0.0001
2	EW Q2	0.663	0.0001	0.680	0.0001
3	EW Q3	0.780	0.0001	0.674	0.0001
4	EW Q4	0.765	0.0001	0.646	0.0001
5	EW Q5	0.827	0.0001	0.796	0.0001
6	EW Q6	0.754	0.0001	0.656	0.0001
Functional Well-being					
1	FW Q1	0.747	0.0001	0.736	0.0001
2	FW Q2	0.772	0.0001	0.854	0.0001
3	FW Q3	0.763	0.0001	0.794	0.0001
4	FW Q4	0.409	0.0001	0.466	0.0001
5	FW Q5	0.620	0.0001	0.652	0.0001
6	FW Q6	0.584	0.0001	0.754	0.0001
7	FW Q7	0.344	0.001	0.515	0.0001

FACT-G function assessment of cancer therapy-general, Physical well-being Question-1(PWQ1), Social well-being Question-1(SWQ1), Emotional well-being Question-1(EWQ1), FW functional well-being Question-1(FWQ1).

In this study, radiotherapy was linked to a noticeable reduction in patients' Quality of Life (QoL), especially in areas like fatigue, pain, emotional well-being, and social interactions. These results are consistent with findings by Clark *et al.*, who also reported a decline in overall QoL and functioning among advanced cancer patients undergoing palliative radiotherapy. However, Clark *et al.*'s study included a nurse-led psychosocial support program, which appeared to help maintain emotional stability and preserve certain aspects of QoL during treatment. Unlike their approach,

our study did not incorporate any formal supportive care, which may explain the more significant emotional and functional challenges experienced by our participants. The relatively stable emotional well-being reported in Clark *et al.*'s intervention group-contrasted with our data showing that more than half of patients experienced some level of emotional distress-highlights the importance of implementing structured psychosocial support during radiotherapy. These findings support the integration



**Figure 2:** Graph-Correlation Between Total Physical & Emotional Wellbeing.

of both medical and psychosocial care to help sustain QoL in patients undergoing cancer treatment (Clark *et al.*, 2012).

## CONCLUSION

This observational study demonstrates that radiation therapy has a significant impact on the Quality of Life (QoL) of cancer patients, especially during the early stages of treatment. Patients experienced a marked decline in several functional areas-such as physical, emotional, and social well-being-alongside a rise in symptoms like fatigue, pain, and sleep disturbances. Encouragingly, by the conclusion of treatment, there was some improvement in QoL, reflecting patients' resilience and capacity to adapt.

These results highlight the need for regular QoL monitoring during radiotherapy to identify and address negative side effects promptly. Incorporating supportive care strategies can help lessen the decline in QoL and enhance overall treatment outcomes. Further research involving larger, multi-centre populations is needed to better understand QoL trends and the impact of supportive interventions.

## ACKNOWLEDGEMENT

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## ABBREVIATIONS

**RT:** Radiation Therapy; **QOL:** Quality of Life; **HRQOL:** Health-Related Quality of Life; **FACT-G:** Functional Assessment of Cancer Therapy-General; **PW:** Physical Well-being; **SW:**

Social Well-being; **EW:** Emotional Well-being; **FW:** Functional Well-being; **IRB:** Institutional Review Board.

## SUMMARY

**Summary.** This prospective observational study assessed Quality of Life (QOL) changes in cancer patients undergoing Radiotherapy (RT) at a tertiary care hospital in Belagavi, India. Using the FACT-G questionnaire, physical, social, emotional, and functional well-being domains were evaluated. Results indicated significant improvement in social well-being post-treatment, while emotional and functional domains showed variable changes. The study emphasizes the importance of psychosocial support during RT to maintain QOL.

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