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Research paper

Factors on The Quality of Life in Family Caregivers of Elderly Patients with Advanced Lung Cancer During Radiotherapy

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Abstract

The quality of life (QoL) of family caregivers is pivotal to the treatment outcomes and prognosis of elderly patients with advanced lung cancer undergoing radiotherapy. This study assessed the multidimensional QoL of 138 caregivers using the Adult Carer Quality of Life Questionnaire (AC-QoL) and identified significant predictors. A cross-sectional survey design revealed that caregivers experienced a moderate overall QoL, with the highest scores in support for caring, sense of value, and ability to care, while the lowest score was observed in caring stress. Multiple regression analysis indicated that gender ($p = .003$), hours of care per week ($p < .001$), and tenure as a caregiver ($p < .001$) significantly predicted QoL, whereas age was not significant ($p = .145$). These findings highlight that male gender, longer caregiving hours, and greater tenure were associated with higher QoL, though stress remained prevalent. To address these challenges, the study underscores the need for caregiver-focused interventions such as stress management, skills training, and social support. Integrating caregiver well-being into oncology nursing practice is essential to enhance both caregiver and patient outcomes.

Keywords: *quality of life, caregivers, lung cancer, radiotherapy, caregiving stress*

1. Introduction

The quality of life (QoL) of patients needing long-term care has been a focus of studies for the past few years. (Palmes et al., 2021; Wali Ahmed et al., 2025). More recently, emphasis has now encompassed the well-being of nurses and caregivers. (Jimenez et al., 2022). The number of family caregivers for elderly cancer patients is steadily increasing worldwide, driven by demographic shifts, extended life expectancies, and the rising prevalence of chronic diseases such as cancer. (Guerra-Martín et al., 2023). In the case of advanced lung cancer, caregivers, often spouses or adult children, become indispensable in providing daily life assistance, emotional support, and rehabilitation exercises. (Zhu et al., 2023). Despite their central role, however, the well-being of caregivers is often overshadowed by the medical and psychological focus on patients. (Ho et al., 2021). This imbalance has drawn growing attention in clinical nursing research, where caregiver health and QoL are increasingly recognized as crucial not only for the caregivers themselves but also for patient recovery and prognosis.

In China, reliance on family caregivers is reinforced by systemic, cultural, and resource-related factors. Structural constraints in the healthcare security system, including limited long-term care and rehabilitation coverage, shift responsibility to families. (Zhou & Dai, 2021). Traditional cultural norms rooted in filial piety impose moral expectations for spouses and children to provide care. (Pan et al., 2022). In addition, the shortage of healthcare professionals compared with developed countries necessitates family involvement in even basic caregiving tasks, such as hygiene and medication management. (Jiang et al., 2024). As a result, family caregivers serve as the de facto providers in both home and hospital contexts, bearing significant emotional, physical, and social burdens. (Wang et al., 2022).

These burdens manifest in multiple domains of life. Research indicates that a large portion of caregivers face moderate to high levels of care burden. (Kondeti et al., 2021). Sleep disorders are a major problem for caregivers. (Robbins et al., 2022), while symptoms of anxiety, depression, and physical exhaustion are widely reported (del-Pino-Casado et al., 2021). Such strains extend beyond health, influencing interpersonal relationships, family functioning, and household economic stability. (McKenna et al., 2022). Caregivers are frequently middle-aged adults balancing dual responsibilities, such as caring for elderly parents while raising children, while also confronting economic challenges from high treatment costs and reduced work opportunities. (Kondeti et al., 2021). Hence, increasing the overall burden and stress affects their QoL.

Importantly, caregiver QoL has direct implications for patient outcomes. Studies have shown that caregivers' psychological and physical states influence patient survival, recovery trajectories, and risk of hospitalization. (Gu et al., 2025; Lee et al., 2022). Supporting caregivers not only improves their well-being, but also enhances continuity of care and patient prognosis (Sak-Dankosky et al., 2022). Yet, most studies have concentrated on caregiver burden and psychological distress with relatively limited attention to the multidimensional nature of QoL, encompassing social, financial, and self-developmental aspects. To address this gap, the present study investigates the QoL of caregivers of elderly patients with advanced lung cancer undergoing radiotherapy using the Adult Carer Quality of Life Questionnaire (AC-QoL). Specifically, it examines demographic and caregiving factors influencing QoL, thereby generating evidence to guide oncology nursing practices and policy.

1.1 Theoretical Framework and Research Objectives

This study draws upon Peplau's (1997) *Interpersonal Relations Theory* and Pender's (2011) *Health Promotion Model*. Within these concepts, Peplau emphasizes interpersonal processes, such as communication, emotional exchange, and role adaptation, that influence stress and coping in the caregiving relationship. Pender highlights the role of self-efficacy, health behaviors, and social support in promoting individual well-being. Combined, these frameworks provide a comprehensive lens for examining how interpersonal dynamics and health-promoting behaviors shape caregivers' QoL. Guided by these theoretical perspectives, the study pursued the following research objectives (RO):

- RO1: To examine the demographic and caregiving profiles of family caregivers of elderly patients with advanced lung cancer during radiotherapy (age, gender, caregiving hours, and tenure)
- RO2: To evaluate caregivers' QoL across the multidimensional domains of the AC-QoL
- RO3: To determine whether demographic and caregiving characteristics significantly predict caregivers' overall QoL

1.2 Significance of the Study

This study contributes to the growing body of research on family caregiving in oncology by addressing the multidimensional nature of caregiver QoL. For hospital administrators and nursing leaders, the findings provide evidence for developing family-centered care strategies and allocating resources to support caregivers. By identifying key predictors of QoL, healthcare institutions can strengthen multidisciplinary collaboration, implement targeted stress management programs, and integrate caregiver well-being into clinical service design. For frontline nurses, the study highlights the importance of recognizing caregivers not only as patient supporters but also as individuals requiring psychosocial and practical assistance. Beyond institutional implications, the study also highlights the broader societal and personal importance of caregiver well-being. Family caregivers can benefit from understanding how demographic and caregiving factors influence their QoL, empowering them to adopt healthier coping strategies and seek available support. Patients may indirectly experience improved treatment outcomes as their caregivers achieve greater stability and resilience. Finally, for researchers, this study extends the literature by focusing on QoL dimensions beyond burden, offering a foundation for future intervention studies aimed at enhancing caregiver support in oncology contexts.

2. Literature Review

2.1 Family Caregivers: Roles and Burdens During Radiotherapy

During radiotherapy for elderly patients with advanced lung cancer, family caregivers assume multidimensional and highly complex roles while simultaneously facing burdens across physiological, psychological, and social domains. (Cheng & Ting, 2022). Functionally, caregivers act as coordinators of collaborative care, such as managing treatment schedules, monitoring symptoms, and facilitating communication with healthcare providers. They also serve as daily living supporters, assisting patients in coping with radiotherapy-induced adverse effects such as fatigue, dysphagia, and dermatological reactions. (J. P. Z. Ng et al., 2023). Equally critical is their role as emotional anchors, providing reassurance and alleviating patients' fear and anxiety (Xu et al., 2024). These diverse responsibilities demand substantial medical knowledge, physical endurance, and emotional regulation skills. (Applebaum & Sannes, 2025). However, such roles expose caregivers to significant strain.

As noted earlier, caregivers often suffer from sleep disturbances, chronic fatigue, and neglect of personal health. Psychologically, they exhibit symptoms of anxiety, depression, and compassion fatigue unique to caregiving contexts. (Liao et al., 2022). Socially, caregiving obligations limit interpersonal participation and disrupt social networks, with financial strain often compounding these effects. (Tough et al., 2022). Symptom fluctuations and uncertainties during radiotherapy further exacerbate stress, placing caregivers at heightened risk of health deterioration and emotional exhaustion. (Bahramia & Nasiri, 2024). Notably, recent research highlights a bidirectional relationship between caregiver QoL and patient clinical outcomes. (Hoshino et al., 2022), emphasizing the ethical necessity of systematic support through respite care, psychological services, and capacity-building programs (Li et al., 2025).

2.2 Quality of Life in Caregivers of Cancer Patients

QoL is defined as an individual's evaluation of their goals, expectations, standards, and concerns within cultural and value systems. (Jimenez et al., 2022). For caregivers of advanced lung cancer patients undergoing radiotherapy, QoL is threatened across all domains, such as physical, psychological, social, and environmental, which are often in dynamic interaction. Physically, sleep disturbances and insomnia are pervasive due to nighttime vigilance and interrupted rest. Nearly half of family caregivers report clinically significant insomnia, which correlates with anxiety, depression, poorer health, and higher burden, underscoring the need for early screening and targeted interventions such as sleep hygiene education and respite support. (Robbins et al., 2022). Psychologically, caregivers experience peaks of distress that often mirror patients' symptom burden, with mid-radiotherapy emerging as a particularly high-risk period. (Williams et al., 2014). Environmentally, financial toxicity poses a critical challenge, with caregivers facing direct medical costs as well as indirect losses from reduced income and opportunity costs. (Mudrazija, 2019). Recent studies suggest that psychological distress mediates the relationship between caregiver burden and health-related QoL, further emphasizing the importance of integrated interventions. (Cui et al., 2024). Taken together, the evidence supports the incorporation of routine screening and multimodal interventions into oncology care pathways to safeguard caregiver well-being.

2.3 Multi-level Influencing Factors on the Quality of Life of Caregivers

Caregivers' QoL is influenced by a complex interplay of physical, emotional, social, economic, and demographic factors. Physically, prolonged caregiving is associated with fatigue, health decline, and musculoskeletal strain, particularly among women who report higher levels of burden. (Benites et al., 2022). Psychologically, extended caregiving heightens risks for anxiety, depression, and emotional exhaustion. (Bevans & Sternberg, 2012). Socially, caregiving disrupts relationships and occupational functioning, with low social support linked to poorer QoL outcomes. (Tough et al., 2022). Economically, financial strain remains a strong determinant of caregiver outcomes, as higher income buffers against stress and predicts better QoL. (Badger et al., 2024). Systematic reviews highlight the importance of psychosocial variables such as self-esteem, social support, cancer health literacy, and distress management as consistent predictors of QoL. (Ng et al., 2020). Gendered differences are also found in several studies, wherein female caregivers report lower satisfaction and poorer health-related QoL compared to their male counterparts. (del Río Lozano et al., 2017; J. H. Y. Ng et al., 2023). Kinship relationships further shape outcomes, with spousal caregivers experiencing higher emotional distress and adult children caregivers facing greater role strain, but often benefiting from stronger support networks. (Blom et al., 2023). Sociodemographic variables, including age, education, and socioeconomic status, are also found to moderate these effects, with younger caregivers reporting greater psychological distress, older caregivers encountering physical limitations, and lower socioeconomic status constraining coping resources. (Cui et al., 2024).

2.4 Intervention Measures for Improving the Quality of Life of Caregivers

Intervention strategies to improve caregiver QoL emphasize the promotion of social support, coping resources, and professional training. Social and family support networks are critical for sharing responsibilities and providing emotional and material assistance. (McCauley et al., 2021). Coping strategies, such as stress management skills and emotional regulation, have been shown to reduce fatigue and psychological burden. (Zajdel et al., 2023). Financial counseling is also essential, as economic strain exacerbates caregiver distress and reduces QoL. (Bouchelle et al., 2024). Importantly, healthcare professionals require training in culturally sensitive approaches to identify vulnerable groups and deliver individualized care that integrates emotional, spiritual, and social dimensions. (Fang et al., 2016). Such culturally informed, holistic strategies align with recent recommendations for family-centered oncology care.

2.5 Technology-Enabled Supports for Family Caregivers

New technologies are beginning to ease the day-to-day strain on family caregivers. A recent review of artificial intelligence (AI) tools found early, but encouraging results: systems that help monitor needs, guide tasks, or triage concerns can reduce effort and improve confidence, although studies vary widely and most remain small and early-stage (Borna et al., 2024). Caregivers themselves report that they are comfortable with everyday digital tools, but less experienced with, and less trusting of, artificial intelligence for care tasks. They want designs that are easy to use, match real household routines, and feel reliable for different ages and family setups. (Wu et al., 2025).

Beyond AI, several technology formats already show practical benefits. Reviews of telehealth and other remote programs report improvements in caregiver mood, confidence, skills, and overall well-being across telephone, video, websites, and mobile applications. These approaches are especially useful because they fit around busy schedules and reduce travel and time costs. (Fernandez-Bueno et al., 2024; Graven et al., 2021; Li et al., 2022; Zhai et al., 2023). Early work with telepresence robots in long-term care homes shows reduced caregiver burden, less loneliness among residents, and better perceived quality of life, with families describing stronger connection and reassurance during virtual visits. (Hung et al., 2025). While studies of social robots in home settings suggest possible reductions in role strain for caregivers of older adults with cognitive challenges, and pilot work in families supporting young adults with developmental disabilities indicates that robots can offer short breaks for caregivers by keeping care recipients engaged and safe for brief periods. Quantitative gains are not universal, but many families describe the tools as acceptable and helpful when they are simple to operate and clearly support everyday routines. (Kim et al., 2022; van Wijngaarden et al., 2025; Xu et al., 2022).

Taken together, international evidence points to three practical lessons. First, technology can complement and not replace human care by offering timely information, coaching, and remote connection. Second, programs work best when they are brief, low-friction, and tailored to the caregiver's cultural context, language, and household logistics. Third, trust and uptake grow when health teams introduce tools gradually, explain what they can and cannot do, and check back on fit and burden. These insights align with the study's recommendations for stress management, skills training, and social support, and suggest that simple digital additions, such as scheduled video check-ins, mobile psychoeducation, or basic remote-monitoring with clear escalation paths, could be integrated into oncology services during radiotherapy to support both caregivers and patients.

2.6 International Context of Caregiver QoL

Cross-national evidence shows that family caregivers' QoL is shaped by a mixture of cultural norms, health-system capacity, and disease/treatment factors. In Singapore, it is found that caregivers in several Asian settings had lower QoL scores than their Western counterparts, suggesting region-wide pressures such as stronger family role expectations and fewer formal supports. (Lim et al., 2017). In addition, the study also noted that male caregivers, Chinese ethnicity, parental caregiving relationships, and advanced patient stage were more tended to be linked with impaired QoL, highlighting how socio-demographics and clinical severity intersect with culture to shape caregiver outcomes. Findings from Malaysia (a multi-ethnic, middle-income setting) also point to substantial psychological strain and clinically relevant symptoms: one in four caregivers screened positive for anxiety or depression, and QoL was worse for hematologic cancers and advanced disease. (Gan et al., 2022). Notably, patient anxiety was associated with poorer caregiver QoL, highlighting dyadic interdependence, which is in reality would surmise into what affects the patients often affects their caregivers in parallel.

From Iran, findings showed relatively higher scores in physical functioning and bodily pain domains, yet QoL varied systematically by caregiver age and gender, duration of caregiving, and by patient clinical factors (Rostami et al., 2023). These results emphasize that both caregiver characteristics and patient/treatment profiles are consistent, cross-cultural predictors of caregiver well-being. While, beyond East and Southeast Asia, a systematic review across Sub-Saharan Africa documented wide variability in how QoL is measured and reported, but drew attention to social determinants, such as: education, access to information/resources, financial distress, and rural–urban residence, alongside coping, locus of control, and religious beliefs as salient influences on QoL for patients and caregivers (Qan'ir et al., 2022). The review also calls for the importance of culturally adapted, standardized tools and more comprehensive supportive care within resource-limited contexts.

Although not oncology-specific, evidence from non-Western caregiving in severe mental illness offers useful parallels: meta-syntheses and reviews from the Middle East and broader non-Western settings report high burden, emotional distress, stigma, strain on family relationships, and unmet support needs, reinforcing that family-centered care models without adequate system supports place significant, sustained pressure on households. (Alqhtani et al., 2021; Alyafei et al., 2021). These themes echo oncology caregiving realities in many Asian and low-resource contexts. Taken together, international evidence suggests that non-Western caregivers often report lower QoL than Western counterparts. Similarly, gender, caregiving duration, and intensity matter across settings, while patient clinical status and psychological distress carry over to caregivers; and lastly, financial and structural barriers amplify strain where formal supports are limited. These patterns somehow align with the current findings and reinforce the value of culturally informed, system-aware interventions that combine stress management, skills training, and financial counseling with pathways to formal and community support, particularly during intensive phases like radiotherapy.

2.7 Synthesis

The reviewed literature highlights the multidimensional burdens of family caregivers of elderly cancer patients during radiotherapy, spanning physical, psychological, social, and economic domains. These burdens are shaped by sociodemographic factors such as gender, age, kinship, and socioeconomic status, while inadequate coping resources and financial strain further exacerbate distress. Interventions grounded in social support, coping enhancement, and professional guidance are essential for improving caregiver QoL. These findings resonate with Peplau's (1997) Interpersonal Relations Theory, which underscores the importance of interpersonal dynamics and role adaptation, and with Pender's (2011) Health Promotion Model, which highlights health behaviors, self-efficacy, and supportive environments. Together, the frameworks provide a conceptual foundation for the current study's objectives: to examine the demographic and caregiving profiles of family caregivers, evaluate their QoL across multidimensional domains, and identify predictors of overall QoL during the radiotherapy period.

3. Methodology

3.1 Research Design

The current study employed a quantitative, descriptive–predictive design using multiple regression analysis to examine the relationship between caregiver QoL and demographic and caregiving factors. Regression was used as an appropriate technique for identifying predictors of outcomes, while descriptive methods provide an accurate profile of the population under study without manipulating variables. (Cohen et al., 2007). This design was selected to systematically describe the QoL of family caregivers and to identify significant predictors in the caregiving context of advanced lung cancer radiotherapy.

3.2 Participants of the Study

The current study was conducted at a certain regional Cancer Hospital in China, which is one of the earliest and most prominent cancer-specialized hospitals with an annual consultation volume of approximately 1,000 patients with advanced lung cancer. Eligible participants were unpaid family caregivers (e.g., spouses, children, siblings, parents) of elderly patients undergoing chest radiotherapy. Inclusion criteria required caregivers to be at least 18 years old, physically capable of participation, and able to provide informed consent. Exclusion criteria included paid caregiving roles or inability to complete the survey due to health or literacy issues. Purposive sampling (Campbell et al., 2020) It was adopted, which is commonly used in quantitative descriptive studies when targeting a specific subgroup. Recruitment was facilitated through ward posters and referrals by clinical nurses. Patients who agreed to participate were asked to identify one eligible caregiver for enrollment. A priori power analysis using G*Power (Faul et al., 2009) Indicated a required minimum of 129 participants for four predictors (effect size $f^2 = .15$, $\alpha = .05$, power = .95). Allowing for a 20% attrition rate, the target sample size was set at 155. Ultimately, 138 caregivers completed the study (see Table 1 for demographic characteristics).

A total of 138 family caregivers of elderly patients with advanced lung cancer participated in the study. The demographic and caregiving characteristics are summarized in Table 1. The average age was 44.6 years, with 42.0% aged 44 years or younger and 58.0% aged 45 years or older. More than half of the participants were male (57.2%), while 42.8% were female. In terms of caregiving hours per week, the largest proportion (38.4%) provided more than 71 hours of care, whereas 19.6% reported 0–10 hours, with the remainder distributed across intermediate categories. The mean caregiving tenure was 4.4 months; approximately two-thirds (66.7%) had provided care for 4 months or less, while one-third (33.3%) had been caregivers for 5 months or longer.

Table 1: Participants' demographics (N=138)

Variable	*n*	%
Age (Mean = 44.6 years old)		
44 years old and below	58	42.0
45 years old and above	80	58.0
Gender		
Male	79	57.2
Female	59	42.8
Hours of Care per Week		
0 to 10	27	19.6
11 to 20	6	4.3
21 to 30	13	9.4
31 to 40	12	8.7
41 to 50	6	4.3
51 to 60	14	10.1
61 to 70	7	5.1
Greater than 71 hours	53	38.4
Tenure of Being a Caregiver (Mean = 4.4 months)		
4 months and below	92	66.7
5 months and above	46	33.3

Note. Percentages may not total 100 due to rounding.

3.3 Instrument

For the current study, Caregiver QoL was measured using the Adult Carer Quality of Life Questionnaire (AC-QoL) (Elwick et al., 2019). This standardized self-report instrument is designed for unpaid adult caregivers and comprises eight domains: (1) support for caring, (2) caring choice, (3) caring stress, (4) money matters, (5) personal growth, (6) sense of value, (7) ability to care, and (8) carer satisfaction. The questionnaire consists of 40 items scored on a 4-point Likert. (1932) Scale. Items are either positively or negatively worded, with reverse scoring applied where appropriate. Total scores range from 0 to 120, with higher scores indicating better QoL (0 to 40 = low; 41 to 80 = moderate; 81 to 120 = high). Subscale scores range from 0 to 15, with similar interpretation bands (0 to 5 = low; 6 to 10 = moderate; 11 to 15 = high). The AC-QoL has demonstrated cross-cultural adaptability. Demographic data, including age, gender, caregiving hours per week, and caregiving tenure, were collected in a separate section of the questionnaire. The AC-QoL was estimated to take approximately 10 minutes to complete. Instructions emphasized privacy, voluntary participation, and the absence of right or wrong answers.

3.4 Data Collection Procedure

Data were collected face-to-face by the primary researcher in collaboration with ward staff. Following ethical (IRB) and administrative approval, recruitment posters were displayed, and clinical nurses assisted in identifying eligible participants. After informed consent was obtained, questionnaires were administered in a private communication room within the department to ensure confidentiality. Caregivers were free to pause or withdraw at any point without penalty. To ensure accuracy and sensitivity, the researcher personally distributed and reviewed completed questionnaires for completeness. Pilot testing with 10 caregivers was conducted before the main study to refine wording and timing. Participants requiring emotional support during or after data collection were referred to hospital mental health services. A volunteer support team was available to provide additional social support when needed. All questionnaires were coded and securely stored.

3.5 Statistical Analysis

Data were encoded into Microsoft Excel and analyzed using IBM SPSS version 25 (on loan from the university). Descriptive statistics (frequency, percentage, mean, M, and standard deviation; SD) were used to profile participants and summarize QoL scores. Multiple regression analysis was employed to determine the predictive influence of age, gender, caregiving hours, and caregiving tenure on overall QoL. Significance was set at $p < .05$.

3.6 Ethical Considerations

The study protocol was reviewed and approved by the University Research Ethics Review Committee and the hospital administration. Ethical principles of autonomy, beneficence, nonmaleficence, and confidentiality were strictly observed. Written informed consent was obtained from all participants. Privacy was protected by anonymous coding, separate storage of consent forms and raw data, and secure password-protected databases. Participants were informed of their right to withdraw at any time. Caregivers who exhibited psychological distress were immediately referred for free psychological counseling provided by registered therapists. Additional social support was arranged through hospital volunteer services when necessary. All data will be destroyed after two years, in line with institutional guidelines.

4. Results

For RO1, which aimed to examine the demographic and caregiving profiles of family caregivers. Referring to Table 1 (in the participants section), findings indicate that caregivers were predominantly middle-aged males, with a substantial portion dedicating extensive time commitments to caregiving, which often exceeds 71 hours per week. While the average tenure was relatively short at just over four months, a significant number had already accumulated longer caregiving experience. These patterns highlight both the intensity of caregiving demands and the relatively recent onset of caregiving responsibilities among many participants.

RO2 examined the multidimensional QoL of caregivers as measured by the AC-QoL (see Table 2). Taken together, the pattern behind Table 2 is clear: caregivers felt supported, capable, and valued, yet stress and financial concerns remained pressure points. This mix suggests that interventions should build on existing strengths (support, competence, meaning) while directly targeting the weak links, such as stress management and financial guidance, during the radiotherapy window. Culturally, the sense of value attached to caregiving may buffer strain, but it does not eliminate it; practical, time-sensitive supports are still needed.

Table 2: QoL of caregivers of elderly patients with advanced lung cancer during radiotherapy (N=138)

Sub-scale	*M*	*SD*	Interpretation
Support for Caring	12.17	3.95	High
Caring Choice	7.42	3.54	Moderate
Caring Stress	5.75	3.70	Low
Money Matters	7.59	2.20	Moderate
Personal Growth	8.67	2.61	Moderate
Sense of Value	11.09	2.88	High
Ability to Care	11.77	2.79	High
Carer Satisfaction	8.26	1.76	Moderate
Quality of Life	72.72	11.99	Moderate

Note. M = mean. SD = standard deviation.

RO3 investigated whether demographic and caregiving factors significantly predicted overall caregiver QoL (see Table 3). The regression model was significant, $F(4, 133) = 7.94$, $p < .001$, with predictors accounting for 19.3% of the variance in QoL ($R^2 = .193$, Adjusted $R^2 = .169$). Among the predictors, gender ($\beta = 5.81$, $t = 3.00$, $p = .003$), hours of care per week ($\beta = 1.78$, $t = 4.80$, $p < .001$), and tenure of caregiving ($\beta = 0.75$, $t = 3.91$, $p < .001$) were statistically significant. Caregivers who were male, provided more hours of care, and had longer caregiving tenure reported higher QoL. Age ($\beta = –0.10$, $t = –1.47$, $p = .145$) was not a significant predictor.

Table 3: Predictors of QoL of caregivers (N=138)

R	R^2	Adjusted R Square	*F*	*df*	*p*
0.439	0.193	0.169	7.943	4, 133	0.000
Variable		*Beta*		*t*	*p*
(Constant)		61.186		16.622	.000
Age		-0.096		-1.467	.145
Gender		5.809		3.003	.003
Hours of Care per Week		1.775		4.802	.000
Tenure of Being a Carer		0.749		3.914	.000

Note. Predictors: (Constant), Age, Gender, Hours of Care per Week, Tenure of Being a Carer

5. Discussions

The demographic and caregiving profiles of participants in this study provide important insights into the context in which family caregivers of elderly patients with advanced lung cancer in China operate. Consistent with prior findings of Kondeti et al. (2021) And Wang et al. (2022)The current study showed that caregiving responsibilities are both time-intensive and emotionally demanding. Nearly 40% of caregivers reported providing more than 71 hours of care per week, underscoring the intensive nature of their involvement during radiotherapy. This is in line with earlier studies indicating that caregiving for patients with advanced cancer often extends beyond routine assistance to encompass daily living support, medical monitoring, and emotional care. (J. H. Y. Ng et al., 2023; Xu et al., 2024). In addition, the relatively short average caregiving tenure (M = 4.4 months) suggests that many caregivers were newly assuming this role. This finding reflects what Bevans and Sternberg. (2012) described as a period of heightened vulnerability, during which caregivers may experience stress from abrupt lifestyle changes and insufficient preparation. At the same time, a substantial subgroup had already provided care for five months or longer, indicating variability in adaptation processes. Such variation reinforces Ochoa et al.'s (2020) The argument that caregiver QoL cannot be viewed as static, but is rather shaped by both duration and intensity of caregiving.

As for the gender distribution, contrary to traditional patterns, where women often predominate in caregiving roles (del Río Lozano et al., 2017)Over half of the participants were male. This may reflect evolving family structures and cultural expectations in China, where filial responsibility can extend to sons as much as daughters. (Pan et al., 2022). Importantly, previous studies have shown that male caregivers sometimes report better perceived QoL compared with female caregivers. (Benites et al., 2022), possibly due to differing coping strategies or access to external support networks. This demographic composition may therefore help explain why gender emerged as a significant predictor of QoL in our regression analysis.

Taken together, these findings resonate with the study's theoretical frameworks. From Peplau's Interpersonal Relations Theory, the abrupt entry into caregiving roles highlights the importance of role adaptation and the stress that accompanies shifting interpersonal dynamics within families. For caregivers who must suddenly balance medical, emotional, and relational responsibilities, communication and role negotiation become central processes influencing their adjustment. Meanwhile, Pender's Health Promotion Model underscores how demographic factors such as gender, caregiving hours, and tenure shape opportunities for health-promoting behaviors. For instance, caregivers with longer hours may have fewer chances to engage in self-care, yet some may develop stronger coping efficacy over time, buffering against stress. Thus, the demographic and caregiving profiles observed in the current study confirm the multidimensional nature of caregiving burdens identified in the literature and highlight how theoretical perspectives on role adaptation and health promotion provide explanatory lenses for understanding caregiver experiences during radiotherapy.

The multidimensional profile of caregiver QoL revealed in this study highlights both strengths and vulnerabilities in the caregiving experience. The overall moderate QoL aligns with prior research showing that family caregivers often maintain functional coping while experiencing strain in specific domains. (Cui et al., 2024; Tough et al., 2022). The high scores for Support for Caring, Ability to Care, and Sense of Value suggest that caregivers felt both competent in their roles and appreciated by those around them. This resonates with McCauley et al. (2021), who emphasized the buffering role of social support in sustaining caregiver well-being. Similarly, Blom et al. (2023) Noted that caregivers who perceive their contributions as meaningful report higher satisfaction despite heavy demands. From a cultural perspective, these results may also reflect the influence of filial piety norms in China. (Pan et al., 2022), 2022), where caregiving is strongly associated with fulfilling moral duties and family expectations.

Conversely, Caring Stress received the lowest score, consistent with earlier findings that stress, fatigue, and anxiety remain prevalent among caregivers of cancer patients. (del-Pino-Casado et al., 2021; Robbins et al., 2022). The presence of moderate financial concerns (Money Matters) further supports studies highlighting the role of financial toxicity in diminishing caregiver QoL. (Badger et al., 2024; Mudrazija, 2019). These findings reinforce that while caregivers draw strength from social and cultural supports, they remain vulnerable to stress and economic strain, echoing the multidimensional burdens as described by Hui-Lin and Ting. (2022) And Wang et al. (2022).

To note further, within the Chinese context, out-of-pocket payments and coverage gaps can amplify caregiver strain. Beyond co-payments for treatment, families often absorb expenses for medications, transportation, lodging near treatment centers, and lost income during prolonged care. These system features help explain the moderate "Money Matters" score in the current sample and indicate a practical target for intervention: brief financial counseling, benefit navigation, and linkage to community aid during radiotherapy. (Zhou & Dai, 2021). Embedding such support within routine nursing pathways could reduce avoidable stressors that otherwise erode caregiver well-being.

Linking these results back to the theoretical framework, Peplau's Interpersonal Relations Theory underscores the importance of interpersonal exchanges in shaping caregiving experiences. Caregivers' high sense of value and perceived support suggest that strong relational bonds and recognition play critical roles in mitigating stress. At the same time, Pender's Health Promotion Model highlights the interplay between self-efficacy and supportive environments in promoting well-being. The high Ability to Care scores reflect caregivers' confidence in their skills, which is central to health-promoting behaviors. Yet, the persistence of stress and financial concerns indicates that external interventions are needed to strengthen coping resources and reduce structural burdens. In sum, the findings for RO2 demonstrate that caregivers' QoL is a multidimensional construct, which is also bolstered by social support and role affirmation, but widely undermined by stress and financial challenges. These results affirm the need for caregiver-focused interventions that build on existing strengths while addressing persistent vulnerabilities through stress management programs, financial counseling, and integrated caregiver support services.

For the predictors of QoL, findings demonstrate that caregiver QoL is shaped by a combination of demographic and caregiving-related factors, confirming the predictive role of certain caregiver characteristics. The significance of gender as a predictor echoes previous studies reporting gendered differences in caregiving experiences. Specifically, male caregivers in this study reported higher QoL than females, consistent with findings that women often experience greater caregiving strain and poorer health-related QoL (Benites et al., 2022; del Río

Lozano et al., 2017). Possible explanations include differential coping strategies, with men more likely to externalize stress or receive instrumental support, while women may internalize emotional burdens and juggle multiple roles (Blom et al., 2023). This highlights the need for gender-sensitive interventions that address the unique vulnerabilities of female caregivers.

The strong positive effect of hours of care per week was somewhat counterintuitive, as longer caregiving time is often associated with higher burden and reduced well-being. (Cui et al., 2024; Kondeti et al., 2021). One possible explanation is that caregivers providing intensive care may develop greater role mastery and coping skills, which align with Peplau's (1997) Emphasis on role adaptation within caregiving relationships. Over time, these individuals may build resilience, perceive stronger role value, and integrate caregiving more effectively into daily routines. This aligns with Ochoa et al. (2020), who noted that coping resources and self-efficacy mediate the relationship between caregiving intensity and QoL.

Similarly, tenure of caregiving positively predicted QoL, suggesting that longer caregiving duration is linked to greater adaptation and resource mobilization. Bevans and Sternberg (2012) Described caregiving as a dynamic process, where initial stress is often replaced by increasing competence and self-confidence. Our findings support this trajectory, where extended tenure provides opportunities for caregivers to establish routines, strengthen social support, and enhance caregiving skills. From the lens of Pender's Health Promotion Model, this reflects the accumulation of self-efficacy and health-promoting behaviors over time, enabling caregivers to maintain well-being despite ongoing demands. The lack of significance for age indicates that caregiver QoL was less influenced by chronological age than by caregiving intensity and duration. This contrasts with studies showing that older caregivers may face physical limitations while younger ones experience greater psychological distress. (Cui et al., 2024). It is possible that the relatively homogenous middle-aged profile of our sample (M = 44.6 years) reduced age-related variability.

Taken together, these findings reinforce the importance of focusing on interpersonal adaptation. (Peplau, 1997) and self-efficacy in health promotion (Pender et al., 2011) As theoretical anchors for understanding caregiver QoL. Male caregivers, those who commit extensive caregiving hours, and those with longer tenure appear to develop relational and behavioral strengths that buffer stress and improve QoL. At the same time, these results highlight groups at risk (e.g., female caregivers, those with shorter caregiving tenure) who may benefit from early, targeted interventions such as stress management training, skills development, and structured social support.

Finally, the modest explained variance ($R^2 = .193$) suggests that additional factors (not included in our model) would likely shape caregiver QoL. Prior work points to socioeconomic position (income, employment, insurance type), caregiver education, health and cancer literacy, resilience and coping styles, perceived social support, and patient clinical status as important contributors. Future studies should incorporate these psychosocial and socioeconomic variables and test mediated pathways (for example, burden, distress, QoL model) to provide a fuller explanatory model [see also Ochoa et al. (2020) And Cui et al. (2024)].

Future work should test brief, low-burden supports that fit the radiotherapy timetable using rigorous designs. Two feasible directions are: (a) randomized controlled trials of short stress-management and skills sessions delivered with follow-up by phone or video, and (b) hybrid effectiveness–implementation pilots that pair routine nursing check-ins with simple digital tools (scheduled video contacts, mobile psychoeducation, or basic remote-monitoring with clear escalation rules). Prior reviews and trials show that telephone/video programs can improve caregiver mood, confidence, and skills, and that well-designed digital supports, including AI guidance and telepresence for connection, are acceptable when easy to use and embedded in usual care. (Borna et al., 2024; Fernandez-Bueno et al., 2024; Graven et al., 2021; Hung et al., 2025; Wu et al., 2025; Zhai et al., 2023).

6. Conclusions

The current study examined the QoL of family caregivers of elderly patients with advanced lung cancer undergoing radiotherapy, with a focus on their demographic profiles, multidimensional well-being, and predictors of overall QoL. Three key conclusions emerge. First, caregivers were predominantly middle-aged males, many of whom devoted substantial hours of care despite relatively short caregiving tenures. This profile reflects the increasing reliance on family-based support systems in oncology care within the Chinese cultural and healthcare context. Second, caregivers reported a moderate overall QoL, with strengths in support, sense of value, and ability to provide care, but vulnerabilities in stress and financial domains. These findings underscore that caregiving is both a source of meaning and resilience as well as a pathway to strain. Third, regression analysis revealed that gender, hours of care per week, and caregiving tenure were significant predictors of QoL, while age was not. Male caregivers, those providing longer hours, and those with greater tenure demonstrated higher QoL, suggesting that adaptation, role mastery, and social recognition may counterbalance caregiving challenges over time. Taken together, the findings highlight that caregiver well-being is not only an ethical imperative but also a determinant of patient outcomes. Guided by Peplau's Interpersonal Relations Theory and Pender's Health Promotion Model, this study shows that relational processes, self-efficacy, and health-promoting behaviors are central to sustaining caregivers during the demanding course of radiotherapy.

Recommendations - The findings suggest that oncology nursing practice must extend its focus beyond patients to include caregivers as integral partners in the treatment process. Structured interventions, such as caregiver education, stress management programs, and psychosocial support services, should be implemented to strengthen coping resources and reduce burden. Hospitals and healthcare systems should also develop community-based caregiver support networks, including respite services and financial counseling, to alleviate economic and emotional strain. Policy initiatives are needed to formally recognize caregivers as "hidden patients," ensuring that their well-being is incorporated into cancer care guidelines and institutional policies. Finally, future research should employ longitudinal and cross-cultural designs to examine changes in QoL over time, test the effectiveness of tailored interventions, and further explore the interplay of cultural values, caregiver adaptation, and health promotion in diverse caregiving contexts.

Strengths and limitations - This study's strengths include the use of a validated, multidimensional instrument (AC-QoL), an a priori–powered sample, and a tight focus on the radiotherapy window in a high-volume oncology center, yielding practice-relevant signals for caregiver support. Limitations are: (i) purposive sampling from a single cancer hospital, which restricts statistical generalizability and makes findings most transferable to urban tertiary centers with a similar case-mix; (ii) the cross-sectional design, which precludes causal inference; (iii) reliance on self-report, introducing possible recall and social-desirability bias; and (iv) relatively short average caregiving tenure, which may underrepresent longer-term adaptation or fatigue. Accordingly, results should be interpreted as hypothesis-generating. Future multi-site, longitudinal studies using probability/stratified sampling and richer socioeconomic/psychosocial covariates should test external validity and mechanisms and evaluate brief, low-burden interventions during radiotherapy.

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