

Factors influencing the hope of patients with advanced cancer while receiving cancer pharmacotherapy

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Abstract

Aim: This study aims to clarify the factors influencing hope in patients with advanced cancer undergoing cancer pharmacotherapy, as influential factors have not been explored in previous studies.

Methods: Participants were patients with advanced lung, colorectal, and breast cancer who were undergoing outpatient pharmacotherapy. A cross-sectional survey was conducted using the Herth Hope Index, the Multidimensional Scale of Perceived Social Support, and the Japanese version of the Integrated Palliative Care Outcome Scale with some additional questions. Data were obtained and analyzed using SPSS version 29.0, with descriptive statistics, t-test, one-way ANOVA, correlation analysis, and multiple regression analysis.

Results: Two hundred valid responses (91.7%) were collected. The average age of the participants was 65.4 years. Multiple regression analysis demonstrated that hope had significant standardized partial regression coefficients with gender ($\beta = -0.137$, $p = .022$), social support ($\beta = -0.246$, $p = .008$), relationship with significant others ($\beta = -0.224$, $p = .015$), sleepiness ($\beta = -0.141$, $p = .025$), nausea ($\beta = -0.159$, $p = .011$), occupation ($\beta = -0.140$, $p = .021$), and economic status ($\beta = -0.124$, $p = .038$) (adjusted $R^2 = 0.341$).

Conclusions: Social support, physical symptoms, and economic and occupational status influence the hope of patients with advanced cancer undergoing cancer pharmacotherapy. Assessing the impact of medication and physical symptoms associated with cancer progression on patients' lives, economic impact of long-term medication, and extent of relationship with people available through work and family may lead to early intervention by identifying individuals who are more likely to experience lower levels of hope.

KEYWORDS

advanced cancer patient, cancer pharmacotherapy, chemotherapy, hope

1 | INTRODUCTION

In recent years, cancer pharmacotherapy has made remarkable progress and continues to evolve with the development of various anticancer drugs that target the genetic characteristics of cancer cells, thereby contributing to improved survival of patients with cancer (Bardia et al., 2021; Conroy et al., 2023; Ferrara et al., 2020). However, patients with advanced cancer undergoing drug therapy are tormented by a sense of stagnation in their lives due to the various side effects of drug therapy (Zhang et al., 2023) and suffer psychological distress due to the uncertainty of continued treatment (Verduzco-Aguirre et al., 2021); thus, they are vulnerable and prone to losing hope. It is important to support patients with advanced cancer who experience various types of pain and difficulties so that they can live with hope.

Hope has been described as the driving force of life for patients with cancer (Dufault & Martocchio, 1985). Furthermore, hope is nurtured in an individual, in relationships with others, and within society. This is crucial in determining how a person feels, thinks, acts, and interacts with the world, and continues to live even when desired goals and outcomes are not achieved (Farran et al., 1995). Therefore, we believe that supporting the maintenance of hope in patients with advanced cancer undergoing pharmacotherapy can be a driving force of life in alleviating their suffering and encouraging them to live their lives as they choose.

Hope in patients with advanced cancer undergoing pharmacotherapy is associated with anxiety (Sjoquist et al., 2013), depression (Schofield et al., 2016; Sjoquist et al., 2013), and quality of life (Sjoquist et al., 2013). Individuals with higher levels of hope have been shown to have lower levels of anxiety and depression and a higher quality of life. Additionally, factors associated with hope in patients with advanced cancer receiving drug therapy have been identified, such as the patient's prognosis as estimated by the health care provider/physician's estimated life expectancy (Cripe et al., 2018), overall survival (Schofield et al., 2016), and expectation of symptom improvement (Sjoquist et al., 2013). Nevertheless, the specific personal and disease-/treatment-related factors that define the preferences of patients with advanced cancer undergoing cancer pharmacotherapy are ambiguous.

By identifying personal and disease-/treatment-related factors that influence hope in patients with advanced cancer undergoing cancer drug therapy, we believe that assessing patients with low hope characteristics may lead to early intervention. Additionally, it can contribute to the care of patients with advanced cancer undergoing cancer pharmacotherapy so that they can maintain their hope, recovery, and personal well-being. Therefore, this study aimed to clarify the factors

influencing hope in patients with advanced cancer undergoing cancer pharmacotherapy, as influential factors have not been explored in previous studies.

2 | DEFINITION OF TERMS

Patients with advanced cancer: Cancer that has recurred or metastasized and is medically determined to be unresectable.

Cancer patient's hope: The driving force for life, including the confidence and expectation of achieving important and feasible goals for the cancer patient, nurtured in the interrelationship between the individual and surroundings. This is based on the definition by Dufault and Martocchio (1985), which Herth (1992) referred to when developing the Herth Hope Index (HHI).

Cancer pharmacotherapy: Anticancer therapy using cytotoxic anticancer drugs, molecularly targeted therapies, and immune checkpoint inhibitors, which are administered intravenously or orally.

3 | METHODS

3.1 | Study design

This cross-sectional study examined the factors influencing hope in patients with advanced cancer undergoing cancer pharmacotherapy.

3.2 | Participants

The study participants were patients with advanced cancer who had undergone outpatient cancer pharmacotherapy at a hospital with an outpatient chemotherapy unit.

3.2.1 | Selection criteria for participants

Patients with lung, colorectal, and breast cancer who were frequently treated with cancer pharmacotherapy were included.

The selection criteria were as follows: (1) patients with lung, colorectal, or breast cancer; (2) patients who were at least 18 years old and received cancer pharmacotherapy for unresectable cancer, including recurrent or metastatic diseases; and (3) patients who had been treated with cancer pharmacotherapy (intravenous or oral anticancer therapy using cytotoxic agents, molecular targeted therapy agents, or immune checkpoint inhibitors) for at least 3 months. The patients were not asked whether they had undergone surgery.

3.2.2 | Exclusion criteria for participants

The exclusion criteria used were as follows: (1) patients with hematologic cancer such as leukemia and malignant lymphoma, (2) patients diagnosed with multiple forms of cancer, (3) patients with cognitive or visual impairments that made it difficult to complete the questionnaire, (4) patients diagnosed with mental disorders, and (5) patients with a performance status of three or higher.

3.3 | Sample size

A sample size test for linear regression was conducted using SPSS version 29.0 (International Business Machines Corporation, New York, USA). The test was performed using the following parameters: power $(1-\beta) = 0.8$, multiple partial correlation coefficient = 0.36, probability of significance $(\alpha) = 0.05$, and total model number of predictions = 30. Consequently, the required sample size was 188, whereas it was established that a sample size of 200 was adequate for this study.

3.4 | Data collection

Data were collected from six sites. Participants selected according to the inclusion and exclusion criteria were provided with an overview of the study by a health care provider or researcher, and questionnaires were distributed after obtaining their consent. The questionnaires were collected using the retention method. Data were collected from June 2023 to June 2024.

3.5 | Measurement tools

3.5.1 | Hope

The HHI (Herth, 1992), which is widely used in oncology, was used as a measure of hope in the 12-item (5-point scale) Japanese version (Yamaki & Yamazaki, 2005). The three sub-concepts of the HHI are “inner sense of temporality and future,” “inner positive readiness and expectancy,” and “interconnectedness with self and interconnectedness with self and others.” The reliability and validity of the scale (Herth, 1992) and the Japanese version have been verified (Cronbach's $\alpha = 0.814$) (Yamaki & Yamazaki, 2005). The total score ranges from 0 to 48, with a higher total score indicating a higher level of hope. The Japanese version of the HHI was used with permission from Yamaki and Yamazaki (2005).

3.5.2 | Related factors

Personal and disease-/treatment-related factors were extracted as hope-related factors based on a systematic review of hope-related factors among patients with cancer undergoing drug therapy (Kitashita & Suzuki, 2023). Studies on patients with cancer undergoing cancer pharmacotherapy and not limited to patients with advanced cancer have reported that patients' levels of hope are higher among those who are religious (Li et al., 2021) and positively correlated with social support (Zhang et al., 2010). Regarding the relationship between patient hope and disease- and treatment-related factors, it has been reported that patients with lower Karnofsky Performance Status have lower levels of hope (Balsanelli & Grossi, 2016) and those on curative treatment have higher levels of hope than those on palliative treatment (Wakiuchi et al., 2015). Additionally, regarding the relationship between patient hope and symptoms, it has been reported that symptom intensity is associated with lower levels of hope (Balsanelli & Grossi, 2016; Kavraddim et al., 2013; Li et al., 2021; Wakiuchi et al., 2015). However, the relationship between age (Kavraddim et al., 2013; Li et al., 2021; Sabanciogullari & Yilmaz, 2021; Zhang et al., 2010), family structure (Kavraddim et al., 2013; Li et al., 2021; Sabanciogullari & Yilmaz, 2021; Zhang et al., 2010), income (Kavraddim et al., 2013; Zhang et al., 2010), employment status (Zhang et al., 2010), educational level (Kavraddim et al., 2013; Li et al., 2021; Sabanciogullari & Yilmaz, 2021; Wakiuchi et al., 2015; Zhang et al., 2010), and hope varies in various studies.

In this study, the personal factors include age, gender, religious affiliation, educational level, social support, as well as marital, cohabitation, employment, and economic status. The scale for social support was the Japanese version (12 items [7-point scale]) of the Multidimensional Scale of Perceived Social Support (Zimet et al., 1990). The Japanese version of this scale has demonstrated criterion-related validity and internal consistency (Iwasa et al., 2007). The total score ranges from 12 to 84, with higher scores indicating higher levels of social support. Additionally, referring to Zimet et al.'s (1990) scale, one item (7-point scale), “I can discuss my values and what I value with my family and significant others,” was used to measure relationships with significant others, and two items (7-point scale), “I can discuss my problems with my health care provider,” and “I can discuss my problems with my health care provider,” were used to measure relationships with health care providers. “I can discuss my problems with my health care provider,” and “I can discuss my values and what I value with my health care provider,” were used to measure relationships with health care providers.

Disease-/treatment-related factors included cancer type, presence of metastasis, performance status, time from cancer diagnosis to treatment, total duration of cancer pharmacotherapy (from the start to the present), route of anticancer drug administration, and symptoms. The Japanese version (Sakurai et al., 2019) of the Integrated Palliative Care Outcome Scale (IPOS, Schildmann et al., 2016) was used for symptoms (10 items [5-point scale]), with the addition of one item for numbness, a symptom that frequently occurs as a side effect of chemotherapy. The Japanese version of the IPOS has demonstrated retest reliability, concomitant, and known-population validities (Sakurai et al., 2019). The total score on the scale ranges from 0 to 44, with higher total scores indicating greater disruption of life due to symptoms.

3.6 | Analysis method

Descriptive statistics were obtained for the HHI, personal factors (age, gender, treatment status, social support, etc.), and disease-/treatment-related factors (cancer type, physical symptoms, etc.). The HHI used the total score for analysis. Reliability coefficients were calculated for the HHI. The HHI was used as the dependent variable, and personal and disease-/treatment-related factors were used as independent variables. The HHI was analyzed using t-tests, one-way ANOVA, and correlation analysis. Factors that were correlated or related to hope were identified, and factors with a significance probability of less than 0.1 were included in a multiple regression analysis. A multiple regression analysis was performed using a stepwise method. SPSS version 29.0 was used to analyze the data.

3.7 | Ethics approval

This study was approved by the Institutional Review Board of Osaka Medical and Pharmaceutical University (Specialized Committee on Nursing Research; Study No. 2022-186). Additionally, the facilities used by the participants were reviewed as required. This study was conducted in accordance with Ethical Guidelines for Medical and Health Research involving Human Subjects.

4 | RESULTS

4.1 | Participant characteristics

Questionnaires were distributed to 224 participants who consented to participate in the study. A total of 218 questionnaires were collected from the 224 participants

(response rate of 97.3%), of which 200 were deemed valid responses (valid response rate of 91.7%). The mean age of the participants was 65.4 years (standard deviation [SD]: 10.40 years). The gender distribution was 134 women (67.0%) and 66 men (33.0%). The cancer types included breast cancer in 73 patients (1.4% men, 98.6% women), colorectal cancer in 68 patients (42.6% men, 57.4% women), and lung cancer in 59 patients (61% men, 39% women). One hundred and thirty patients (65.0%) had metastatic cancer (Table 1).

4.2 | Hope status

The mean HHI score of the participants was 35.59 (SD, 5.20; range: 19–48) for HHI. The reliability coefficient (Cronbach's alpha) of the 12 items of the HHI scale was 0.853.

4.3 | Relationship between Hope and personal factors

Hope was significantly associated with employment ($p = .024$) and economic deprivation ($p = .005$) as personal factors, with higher levels of hope among those who were employed and those without economic deprivation. Hope was significantly associated with gender ($p = .008$), with women tending to have higher levels of hope than men (Table 2).

Hope was positively correlated with social support ($r = 0.493$, $p < .001$), with higher levels of hope associated with higher levels of social support. Hope was positively correlated with significant others, “I can discuss my values and what I value with my family and significant others” ($r = -0.484$, $p < .001$). Hope was positively correlated with the relationship with significant others, “I can talk about my problems with my health care provider,” ($r = -0.256$, $p < .001$) and “I can discuss my values and what I value with my health care provider” ($r = -0.193$, $p = .006$).

4.4 | Relationship between hope and factors related to disease and treatment

The results of the one-way ANOVA (Tukey Honestly Significant Difference) showed that the cancer site was significantly different from hope ($p = .052$). The mean scores for hope were 34.42 for patients with lung cancer, 35.66 for patients with breast cancer, and 36.53 for patients with colorectal cancer, with patients with lung cancer having significantly lower levels of hope than patients with colorectal cancer ($p = .059$).

TABLE 1 Characteristics of study participants (*n*=200).

Age(years)	<i>n</i>	%
Average 65.35 (SD10.40) 27–86		
<65	87	43.5
≥65	113	56.5
Gender		
Men	66	33.0
Women	134	67.0
Cancer site		
Lung	59	29.5
Breast	73	36.5
Colon	68	34.0
Metastasis		
Yes	130	65.0
No	70	35.0
Performance status		
0	67	33.5
1	133	66.5
Duration from cancer diagnosis average 53.21 (SD66.11) 3–548 months		
3 months to 1 year	45	22.5
2–5 years	100	50.0
More than 5 years	55	27.5
Duration from start of drug therapy average 35.5 (SD42.08) 3–272 months		
3 months to 1 year	73	36.5
2 to 3 years	64	32.0
More than 3 years	63	31.5
Route of administration of anticancer drugs		
Intravenous infusion only	125	62.5
Oral medication only	10	5.0
Oral medication and intravenous infusion	65	32.5
Marital status		
Married	142	71.0
Single	58	29.0
Cohabitation		
Yes	173	86.5
No	27	13.5
Employment		
Yes	71	35.5
No	129	64.5
Religion		
Yes	42	21.0
No	158	79.0
Economic deprivation		
Yes	67	33.5
No	133	66.5
Educational background		
High school graduate and under	127	63.5
Junior college or vocational school graduate or higher	73	36.5

TABLE 2 Relationship between hope and related factors.

	<i>n</i>	HHI	
		Mean	<i>p</i>
Relationship between hope and individual factors			
Age (years) average 65.35 (SD10.40) 27–86			
<65	87	36.18	0.157
≥65	113	35.13	
Gender			
Men	66	34.20	0.008
Women	134	36.28	
Marital Status			
Married	142	35.72	0.587
Single	58	35.28	
Cohabitation			
Yes	173	35.77	0.22
No	27	34.44	
Employment			
Yes	71	36.70	0.024
No	129	34.98	
Economic deprivation (Economic Condition)			
Yes	67	34.15	0.005
No	133	36.32	
Religion			
Yes	42	36.43	0.241
No	158	35.37	
Social support			
High-score group	102	37.64	<.001
Low-score group	98	33.46	
Educational background			
High school graduate and under	127	35.42	0.537
Junior college or vocational school graduate or higher	73	35.89	
Relationship between hope and disease–/treatment-related factors			
Cancer site			
Lung	59	34.42	0.052
Breast	73	35.66	
Colon	68	36.53	
Metastasis			
Yes	130	35.95	0.179
No	70	34.91	
Physical symptoms			
High-score group	103	34.85	0.039
Low-score group	97	36.37	
Performance status			
0	66	36.26	0.171
1	133	35.19	

TABLE 2 (Continued)

		HHI	
	<i>n</i>	Mean	<i>p</i>
Duration from cancer diagnosis average 53.21 (SD66.11) 3–548 (month)			
3 months to 1 year	45	35.60	0.730
2–5 years	100	35.33	
More than 5 years	55	36.05	
Duration from start of drug therapy average 35.5 (SD42.08) 3–272 (month)			
3 months to 1 year	73	35.75	0.633
2–3 years	64	34.44	
More than 3 years	63	36.57	
Route of administration of anticancer drugs			
Intravenous infusion Only	125	35.82	0.501
Oral medication Only	10	33.90	
Oral medication and Intravenous Infusion	65	35.40	

Abbreviation: HHI: Herth Hope Index.

TABLE 3 Correlation between hope and physical symptoms.

	HHI	
	Correlation coefficient	<i>p</i>
Pain	−0.123	0.083
Shortness of breath	−0.039	0.582
General fatigue	−0.081	0.255
Nausea	−0.152	0.032
Vomiting	−0.187	0.008
Loss of appetite	−0.125	0.077
Constipation	−0.096	0.177
Sore and thirsty mouth	−0.054	0.444
Sleepiness	−0.254	<.001
Difficulty moving	−0.172	0.015
Numbness	−0.025	0.725

Regarding physical symptoms, hope was associated with fatigue ($r = -0.254$, $p < .001$), nausea ($r = -0.152$, $p = .032$), vomiting ($r = -0.187$, $p = .008$), difficulty in moving ($r = -0.172$, $p = .015$), and anorexia ($r = -0.125$, $p = .077$), and the more severe the symptoms, the lower the level of hope (Table 3).

4.5 | Factors influencing hope

Factors that were identified as correlated or related to hope and had a probability of significance less than 0.1 (gender, occupation, economic status, cancer site, social

support, relationship with significant others, and relationship with health care providers) were included in the multiple regression analysis. The results showed that patients with advanced cancer undergoing cancer pharmacotherapy had higher hope for gender ($\beta = -0.137$, $p = .022$), social support ($\beta = -0.246$, $p = .008$), relationships with significant others ($\beta = -0.224$, $p = .015$), fatigue ($\beta = -0.141$, $p = .025$), nausea ($\beta = -0.159$, $p = .011$) symptoms, occupation ($\beta = -0.140$, $p = .021$), and economic status ($\beta = -0.124$, $p = .038$); each with a significant standardized partial regression coefficient ($R = 0.604$, adjusted $R^2 = 0.341$, Durbin-Watson ratio: 1.926) (Table 4).

5 | DISCUSSION

5.1 | Hope status of patients with advanced cancer undergoing cancer pharmacotherapy

The mean HHI of patients with advanced cancer receiving cancer pharmacotherapy was 35.59, and no statistically significant difference in the mean HHI was observed between those with and without metastases ($p = .179$). This implies that the HHI score was comparable to the findings of a meta-analysis (Kitashita & Suzuki, 2023) of mean HHI scores of 35.64 for patients with cancer at various stages undergoing cancer pharmacotherapy. However, previous studies have reported that among patients undergoing chemotherapy, those with metastases exhibited lower levels of hope than those

TABLE 4 Factors influencing the hope of patients with advanced cancer undergoing cancer pharmacotherapy (multiple regression analysis: Stepwise method model 7).

	Unstandardized coefficient		Standardization coefficient		<i>t</i> -value	<i>p</i>	VIF
	B	Standard error	β				
Social Support	0.086	0.032	0.246	2.678	0.008	2.553	
Sleepiness	−0.794	0.352	−0.141	−2.254	0.025	1.174	
Relationships with significant others	0.797	0.324	0.224	2.464	0.015	2.495	
Nausea	−1.102	0.429	−0.159	−2.57	0.011	1.157	
Gender	1.513	0.656	0.137	2.307	0.022	1.064	
Occupation	−1.515	0.651	−0.140	−2.326	0.021	1.087	
Economic deprivation	−0.676	0.324	−0.124	−2.087	0.038	1.065	

Abbreviation: VIF, variance inflation factor.

without ($p < .001$) (Wakiuchi et al., 2015). Additionally, those undergoing palliative chemotherapy demonstrated lower levels of hope than those undergoing curative chemotherapy ($p < .001$) (Wakiuchi et al., 2015). These findings suggest that the assumption that patients with advanced cancer undergoing pharmacotherapy have lower levels of hope is not universal. A novel finding of this study is that it is possible for patients with advanced cancer to undergo long-term pharmacotherapy to maintain hope.

Further research is required to identify coping strategies and support systems used by patients with advanced cancer undergoing cancer pharmacotherapy to maintain hope during long-term treatment.

5.2 | Factors influencing Hope of patients with advanced cancer receiving cancer pharmacotherapy

These findings indicated that several factors, such as gender, social support, relationships with significant others, symptoms of sleepiness and nausea, and occupational and economic status, are associated with hope in patients with advanced cancer undergoing cancer pharmacotherapy.

5.2.1 | Hope and gender

The results indicated a significant association between gender and hope ($p = .008$), with women exhibiting higher levels of hope than men. Studies examining gender differences in hope among patients with cancer undergoing chemotherapy are insufficient. A previous study reported no statistically significant difference between gender and hope among patients with cancer undergoing outpatient adjuvant or palliative chemotherapy (Kavradim et al., 2013). In this study, the higher level

of hope among women than men among patients with advanced cancer undergoing cancer chemotherapy may be attributed to the fact that a greater percentage of women have been diagnosed with breast cancer, which has the potential for long-term survival even after recurrence or metastasis, whereas a greater percentage of men have been diagnosed with lung cancer, which is associated with inadequate prognosis. It would be beneficial for future studies to explore the relationship between gender and hope while controlling for factors that affect gender differences.

5.2.2 | Hope and connection with people and society

The findings indicated that social support was a significant predictor of hope among patients with cancer ($\beta = -0.246$, $p = .008$). In patients with advanced breast cancer and unknown treatment status, structural equation modeling revealed that social support influenced hope in younger (aged 54 years or younger; $\beta = 0.40$) and older patients (aged 55 years or older; $\beta = 0.30$) (Hasson-Ohayon et al., 2014). A multiple regression analysis revealed that patients' perception of family support ($\beta = -0.17$) was a significant predictor of their total hope score in a study of patients with cancer undergoing chemotherapy as outpatients. Patients with higher hope scores reported higher perceived family support (Kavradim et al., 2013). Moreover, other studies have reported that postoperative patients with lung cancer (Bando et al., 2018), bladder cancer (Li et al., 2016), central nervous system tumor(s) (Bao et al., 2019), and various cancer types and at various stages (Khater & Alkwiese, 2013; Proserpio et al., 2015) exhibit a positive correlation between hope and social support. These findings suggested that social support is a major factor in maintaining hope among patients with cancer,

irrespective of cancer type, progression, or treatment status. Furthermore, participants' hope was influenced by their relationship with their significant others, "I can discuss my values and what I value with my family and significant others" ($\beta = -0.224$, $p = .015$). Patients with advanced cancer undergoing chemotherapy have been reported to experience difficulties discussing issues related to treatment continuation, financial concerns, and existential matters (Ikander et al., 2022). Therefore, we contend that the presence of significant others and social support for patients with cancer undergoing cancer pharmacotherapy to openly discuss difficult issues can reduce the burden of continuing treatment and other problems and maintain hope, which is the driving force for patients to live.

The results of this study indicated that individuals engaged in a profession exhibited higher levels of hope ($\beta = -0.140$, $p = .021$) compared to those who were not. A review of the relationship between hope and work among general employees reported positive correlations between hope and work performance as well as hope and employee well-being (Reichard et al., 2013). Meaningful work facilitates the development of meaning in life and reinforces interpersonal relationships (Steger, 2019). For patients with advanced cancer undergoing cancer pharmacotherapy, relationships with others and a sense of meaningfulness derived from working while undergoing treatment may contribute to positive meaning in their lives, which may foster hope for the individual. Cancer pharmacotherapy for patients with advanced cancer continues indefinitely as long as the therapeutic effect is observed. Patients with advanced cancer undergoing cancer pharmacotherapy must cope with the physical symptoms of cancer progression (Siemens et al., 2020) and the side effects of cancer pharmacotherapy (Nozawa et al., 2013). It is difficult for patients with advanced cancer to continue working while undergoing cancer pharmacotherapy. However, the results showed that working while undergoing cancer pharmacotherapy leads to the maintenance of hope in patients with advanced cancer ($\beta = -0.140$, $p = .021$). Therefore, employment support for patients with cancer in Japan (Ministry of Health, Labour and Welfare, 2025) is a beneficial strategy. The future challenge will be to establish a model of employment support that enables patients with advanced cancer to maintain hope while balancing cancer pharmacotherapy and work through collaboration among multidisciplinary professionals.

These findings indicated that social support, relationships with significant others, and occupation are crucial for sustaining the hope levels of patients with cancer undergoing cancer pharmacotherapy. It is crucial to assess the employment status and family relationships of patients with advanced cancer undergoing pharmacotherapy to

identify those who are more likely to exhibit low levels of hope and provide early intervention to maintain hope.

5.2.3 | Hope and physical symptoms

The presence of physical symptoms, specifically nausea ($\beta = -0.159$, $p = .011$) and sleepiness ($\beta = -0.141$, $p = .025$), was found to have a negative impact on the hope levels of the participants.

Despite advances in antiemetic therapy associated with cancer pharmacotherapy (Jordan et al., 2014), more than 20% of patients continue to experience high levels of distress owing to chemotherapy-induced nausea (Singh et al., 2022). Additionally, studies have demonstrated that advanced cancer is correlated with the severity of delayed nausea ($p < .05$) (Puri et al., 2018). Furthermore, the risk of anticipatory nausea increases with increasing frequency of chemotherapy (Chan et al., 2015). Therefore, it is hypothesized that patients with advanced cancer undergoing long-term cancer pharmacotherapy are more likely to experience fatigue and exhaustion because of the distress caused by nausea. Physical health provides the energy necessary to cope with stress (Lazarus & Folkman, 1984). It is postulated that profound distress caused by nausea results in the depletion of the energy required to cope with stress and survive, thereby rendering it challenging for patients with advanced cancer undergoing cancer pharmacotherapy to maintain their hope.

Additionally, the participants' hope was found to be influenced by the symptom of sleepiness ($\beta = -0.141$, $p = .025$). Excessive daytime sleepiness has been documented to be more prevalent due to chemotherapy ($p = .012$) and in individuals with recurrent cancer ($p = .011$) (Saberzadeh-Ardestani et al., 2019). Patients with advanced cancer undergoing cancer pharmacotherapy have an increased risk of sleepiness. Regarding survivors of breast cancer, after completing chemotherapy, daytime sleepiness is said to affect perceived cognitive function deterioration (Henneghan et al., 2018), and sleepiness may affect hope-related thinking and cognitive coping. It is possible that sleepiness influences hope-related thoughts and cognitive coping.

Regarding the relationship between hope and symptoms in patients with cancer undergoing cancer pharmacotherapy, patients with breast cancer undergoing curative chemotherapy have been found to have lower levels of hope when the symptom burden (Li et al., 2021) or pain is high (Balsanelli & Grossi, 2016). It has been found that patients with cancer undergoing chemotherapy for curative or palliative treatment have lower levels of hope when experiencing pain (Wakiuchi et al., 2015) and mouth ulcers (Kavradim et al., 2013). Thus, previous

studies have shown that pain is a symptom related to hope in patients with cancer undergoing cancer pharmacotherapy. The finding of this study that symptoms of nausea and sleepiness affect the hope of patients with cancer undergoing cancer pharmacotherapy has not been reported in previous studies, and this is a novel finding. Nausea and sleepiness, among other symptoms, influence the hope of patients with advanced cancer receiving cancer pharmacotherapy. Therefore, it is important to focus on these symptoms as well as pain and address symptom management from an early stage. Additionally, we believe that exploring how symptoms of nausea and sleepiness are perceived by patients with advanced cancer undergoing cancer pharmacotherapy will help understand the meaning of symptoms in the hope of patients with advanced cancer and to practice nursing care that is attuned to the patients' experience.

5.2.4 | Hope and economic status

Economic status affected hope ($\beta = -0.134$, $p = .024$), with lower hope among those experiencing financial challenges. Cancer treatment is often expensive, and the financial burden increases with time from diagnosis (Carrera et al., 2018). It has been reported that the financial burden increases with cancer stage progression (Saeki et al., 2023; Xu et al., 2024). As patients with advanced cancer undergoing cancer pharmacotherapy are prone to financial distress owing to the costs associated with continued cancer pharmacotherapy and the increased costs associated with symptom management due to cancer progression, it is important to collaborate with social workers and other multidisciplinary professionals to help them maintain their existing lifestyles as much as possible.

5.3 | Strengths and limitations of the study

This study was conducted in six institutions, including a university hospital, a city hospital, and a hospital operated by the Japan Community Health Care Organization, which compensates for the generalizability of the results to patients with advanced cancer undergoing pharmacotherapy. However, this was a cross-sectional study, and it was difficult to longitudinally investigate the factors related to the wishes of patients with advanced cancer, whose condition is prone to change, and to clarify causal relationships. Based on the results of this study, further research should screen patients with low levels of hope and develop a nursing intervention model to maintain hope.

6 | CONCLUSIONS

The following factors influenced hope in patients with advanced cancer undergoing cancer drug therapy: gender, social support, relationships with significant others, symptoms of nausea and sleepiness, and economic and occupational status. Assessing the physical symptoms associated with medication and cancer progression, economic impact of long-term medication, and extent of relationships with people available through work, family, and other sources can help identify individuals who are more likely to experience lower levels of hope, thereby enabling early intervention.

AUTHOR CONTRIBUTIONS

Mari Kitashita contributed to the conception and design of this study, performed the statistical analysis, and drafted the manuscript; and Kumi Suzuki critically reviewed the manuscript and supervised the whole study process. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest.

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