

A Study on the Influences of the COVID-19 Pandemic-Related Depression, Anxiety, Stress, and Treatment-Crisis on Quality of Life in Cancer Patients – A Secondary Publication

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Abstract: *Objective:* To investigate the factors affecting the quality of life of cancer patients by examining the degree of the COVID-19 pandemic-related depression, anxiety, stress, and treatment crisis. *Methods:* Data were collected from 132 cancer patients undergoing surgery, chemotherapy, radiotherapy, and hormone therapy at K University Hospital in D City using a structured questionnaire. The period of data collection was from May 6 to May 28, 2022. The collected data were analyzed using descriptive statistics, *t*-test, ANOVA, Pearson's correlation, and stepwise multiple regression. *Results:* The mean scores of quality-of-life, depression, anxiety, stress, and treatment crisis during the COVID-19 pandemic were 84.64 ± 29.09 , 15.14 ± 6.49 , 4.66 ± 5.27 , 75.83 ± 17.70 , and 78.52 ± 19.95 , respectively. In terms of factors affecting the quality of life related to the COVID-19 pandemic, COVID-19 pandemic-related stress ($\beta = 0.41$, $P < 0.001$) appeared to have the greatest impact, followed by COVID-19 pandemic-related treatment-crisis ($\beta = 0.28$, $P = 0.002$), anxiety ($\beta = 0.21$, $P = 0.002$), and gender ($\beta = 0.14$, $P = 0.009$), with a total explanatory power of 67.6%. *Conclusion:* To improve the quality of life during the COVID-19 pandemic, COVID-19 pandemic-related stress, treatment-crisis, and anxiety should be periodically monitored and nursing interventions such as education on infection prevention, management, and emotional support programs should be provided to decrease the COVID-19 pandemic-related stress, treatment-crisis, and anxiety.

Keywords: Cancer; COVID-19; Quality of life

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1. Introduction

1.1. Study purpose

Coronavirus disease 19 (COVID-19) is a new type of acute respiratory infectious disease that first emerged in December 2019 and has since spread globally. In Korea, it spread rapidly locally, starting with the first confirmed case in January 2020, and internationally, it recorded high infection and mortality rates across

countries in just four months, leading the World Health Organization (WHO) to declare a pandemic, the highest classification of infectious disease ^[1].

Large-scale outbreaks of infectious diseases tend to make people feel more fearful of the potential risk of infection than the actual risk of infection itself ^[2] and are reported to undermine people's basic sense of security, causing not only fear of infection, but also maladaptive emotional and behavioral responses such as stress, decreased life satisfaction, depression, and anxiety ^[3]. In particular, the quarantine measures implemented to prevent the spread of COVID-19, such as social distancing, telecommuting, and restrictions on private gatherings, have led to social disconnection and isolation, which have exacerbated a range of COVID-19 pandemic-related psychological and emotional problems, including depression, anxiety, stress, fear, anger, and loneliness ^[4]. In particular, COVID-19 pandemic-related quality of life, one of the newly emerging terms such as corona blue, refers to an individual's perceived subjective well-being and satisfaction with the physical, social, and emotional domains experienced during the COVID-19 pandemic, as opposed to traditional health-related concepts of quality of life ^[5]. Psychological and emotional problems caused by the COVID-19 pandemic have been shown to contribute to poor COVID-19 pandemic-related quality of life ^[6].

The various psychological and emotional problems caused by COVID-19 may be even more severe for cancer patients ^[7]. Cancer patients are psychologically traumatized by the diagnosis of cancer alone, with 10 to 20 percent reporting depression and anxiety, and stress levels are very high due to the uncertainty of treatment and the burden of the treatment process ^[8]. In particular, during the COVID-19 pandemic, 64.3% of cancer patients reported depression ^[9], and 67.5% reported anxiety ^[10], which is about 2 to 2.5 times higher than the rates of 29.7% of the general population ^[4], and 18.92% of adolescents ^[10], respectively. In addition, during the COVID-19 pandemic, 31.6% of cancer patients reported stress ^[11], which is about three times higher than the rates of about 10% of the general population ^[12].

In particular, the lack of clear treatment guidelines for cancer patients with impaired physical functioning during COVID-19 infection has led to further anxiety and severe stress for cancer patients ^[4]. The European Society for Radiotherapy and Oncology (ESRO) has recommended minimizing hospital visits for cancer patients or using telephone consultations instead of in-person visits, which has led 20% of cancer patients to postpone chemotherapy and 5% to postpone additional anti-cancer treatments beyond chemotherapy ^[13]. These delays or cancellations of care and treatment have created a significant treatment crisis for cancer patients, with 86.5% of cancer patients reporting a sense of crisis that they may not receive adequate cancer care due to COVID-19 ^[10].

As can be seen, a large-scale infectious disease such as COVID-19 can cause serious psychological and emotional problems across society, and for cancer patients at high risk for COVID-19, pandemic-related depression, anxiety, and stress, as well as feelings of treatment crisis due to delays and interruptions in cancer treatment, can further exacerbate cancer patients' pandemic-related quality of life. However, few studies have examined the extent of COVID-19 pandemic-related depression, anxiety, stress, treatment crisis, and quality of life among cancer patients during the COVID-19 pandemic and how these factors affect COVID-19 pandemic-related quality of life, and none have examined treatment crisis among cancer patients during the pandemic. Therefore, this study aims to investigate the extent of depression, anxiety, stress, and treatment crisis related to the COVID-19 pandemic, determine how these factors affect the quality of life of cancer patients during the COVID-19 pandemic, and provide basic data for the development of nursing interventions that can prevent the development of pandemic-related depression, anxiety, stress, and treatment crisis in cancer patients and improve their quality of life during the pandemic.

1.2. Study objectives

The purpose of this study is to investigate the extent of COVID-19 pandemic-related depression, anxiety, stress, and treatment crisis among cancer patients and to determine how they affect their COVID-19 pandemic-related quality of life, with the following specific objectives:

- (1) To determine the level of depression, anxiety, stress, treatment crisis, and quality of life related to the COVID-19 pandemic according to the participants' general characteristics and disease-related characteristics.
- (2) To identify differences in COVID-19 pandemic-related quality of life by participants' general and disease-specific characteristics.
- (3) To identify relationships among subjects' COVID-19 pandemic-related depression, anxiety, stress, treatment distress, and quality of life.
- (4) To determine the impact of subjects' COVID-19 pandemic-related depression, anxiety, stress, and treatment crisis on their COVID-19 pandemic-related quality of life.

2. Research methods

2.1. Study design

This is a descriptive survey study to investigate the extent of depression, anxiety, stress, and treatment crisis related to the COVID-19 pandemic among cancer patients and to identify factors that influence the quality of life related to the COVID-19 pandemic among cancer patients.

2.2. Research subjects

The subjects of the study were cancer patients who have undergone or are currently undergoing surgery, chemotherapy, radiotherapy, hormone therapy, etc. at K University Hospital in D Metropolitan City who met the selection criteria. Specifically, the inclusion criteria were: (1) age 19 or older, (2) having received or undergoing one or more treatments such as surgery, chemotherapy, radiation therapy, or hormone therapy, (3) being able to understand and respond to the questionnaire, and (4) understanding the purpose of the study and voluntarily agreeing to participate. Exclusion criteria were: (1) those who have cognitive impairment due to brain tumor, dementia, intellectual disability, etc., and (2) those with psychiatric history and receiving medication.

The sample size was calculated using the G*power 3.1.9.4 program, and based on the results of a previous study^[14], the minimum sample size required for the study was 118, with a moderate effect size of 0.15, a significance level of 0.05, a power of 0.80, and 10 predictor variables (depression, anxiety, stress, treatment crisis, age, gender, occupation, religion, stage, and diagnosis) for regression analysis. Considering a 15% dropout rate, 139 questionnaires were distributed and returned, of which 7 questionnaires with insufficient responses were excluded, leaving 132 for final analysis.

2.3. Research instruments

- (1) COVID-19 pandemic-related depression: The depression tool developed by Lovibond and Lovibond^[15] was used to measure depression related to the COVID-19 pandemic, which was modified and adapted into Korean by Narigele^[16] after receiving approval for use. The tool consists of 6 items, each rated on a 5-point Likert scale with 1 being "not at all" and 5 being "very much so," with a range from a low of 6 to a high of 30, with higher scores indicating higher levels of depression related to the COVID-19 pandemic. The reliability of the tool was 0.89 at the time of development and Cronbach's α was .91 in this study.
- (2) Anxiety related to the COVID-19 pandemic: The Coronavirus Anxiety Scale (CAS) developed by

Sherman ^[17] and adapted by Lee ^[18] was used to measure anxiety related to the COVID-19 pandemic. The tool is designed to assess anxiety by the extent to which participants experience anxiety symptoms (dizziness, sleep disturbance, lethargy, loss of appetite, digestive distress) when they hear thoughts or information about COVID-19. There are five questions, each rated on a 5-point Likert scale ranging from 0 for “not at all” to 4 for “very much so,” and the tool ranges from a low of 0 to a high of 20, with higher scores indicating higher anxiety related to the COVID-19 pandemic. The reliability of the tool was .92 at the time of development and Cronbach’s α was 0.93 in this study.

- (3) COVID-19 pandemic-related stress: The COVID-19 Stress Scale for Korean People (CSSK) tool developed by Kim *et al.* ^[19] was used after receiving approval for use. The tool consists of 21 items and is divided into three sub-scales: fear of infection (9 items), difficulty in social distancing (6 items), and anger toward others (6 items). Each item is rated on a 5-point Likert scale with 1 being “not at all” and 5 being “very much so,” and the tool ranges from a low of 21 to a high of 105, with higher scores indicating higher levels of pandemic-related stress. The reliability of the tool was 0.91 at the time of development, and Cronbach’s α was 0.95 in this study.
- (4) COVID-19 pandemic-related treatment crisis: COVID-19 pandemic-related treatment crisis refers to the fear of delayed cancer diagnosis or treatment, delayed appropriate care or referral, and social isolation or lack of social support due to the COVID-19 pandemic ^[20]. In this study, the COVID-19 pandemic-related treatment crisis instrument was developed by the researcher based on the results of a previous study ^[20] that investigated the COVID-19 pandemic-related treatment crisis through qualitative research. The tool consisted of 21 questions, including 4 questions about treatment, 4 questions about mental health, 3 questions about cancer diagnosis, 3 questions about the ongoing care process, 4 questions about daily health, and 3 questions about coping and adjustment. The preliminary items were validated by six experts (two cancer center professors, two oncology nursing professors, and two oncology nurse practitioners) for the item content validity index (I-CVI), and items with an I-CVI score of .80 or higher were selected for the instrument. To clarify the meaning of the preliminary items, we revised item 5, “I was worried about being blamed for social isolation due to COVID-19,” to “I was worried about being infected with COVID-19 and being blamed as a spreader,” based on expert opinions. Question 21, “I was worried that I would not be able to interact with other patients or get support from online support groups due to COVID-19,” was reworded to “I was worried that I would not be able to interact with other patients or get support from online support groups due to COVID-19,” and the word “online” was removed to “I was worried that I would not be able to interact with other patients or get support from online support groups due to COVID-19.” Each question is rated on a 5-point Likert scale with 1 being “not at all true” and 5 being “very true,” and the tool ranges from a low of 21 to a high of 105, with higher scores indicating higher levels of COVID-19 pandemic-related treatment crisis. The tool had a Cronbach’s α of 0.98 for reliability.
- (5) Quality of life related to the COVID-19 pandemic: The COVID-19 pandemic-related quality of life instrument was adapted from the World Health Organization Quality of Life Assessment Instrument (WHOQOL) developed by Min *et al.* ^[21] and revised by Kim *et al.* ^[5] after receiving approval for use. The instrument consists of 23 questions and five sub-scales: 7 questions on difficulties due to changes in personal life, 7 questions on difficulties due to changes in external activities, 2 questions on difficulties due to changes in activities with family, 3 questions on difficulties due to changes in work/school, and 4 questions on difficulties with cumbersome procedures. Each question is rated on a 6-point Likert scale with 1 being “not at all” and 6 being “very much so,” and the instrument ranges from a low of 23 to a high of 138, with higher scores indicating lower quality of life. The reliability of the tool was

0.93 at the time of development, and Cronbach's α was 0.97 in this study.

2.4. Data collection

The data collection was conducted at K University Hospital in D Metropolitan City from May 6, 2022, to May 28, 2022, and the survey was started after explaining the purpose and objectives of the study to the head of the outpatient department and the ward manager and obtaining their consent to collect data. The subjects of this study were cancer patients who visited the hospital for treatment such as surgery, chemotherapy, radiation therapy, and hormone therapy, and who expressed interest in participating in the study through recruitment advertisements posted on the bulletin boards in front of the outpatient department, chemotherapy injection rooms, and wards. The researcher explained the purpose of the study, questionnaire, and data collection methods and procedures to the patients, and surveyed them after receiving their consent to participate in the study. The researcher read the questionnaire to the subjects if they had poor eyesight or if they wanted to, and recorded their responses. The questionnaire was administered once, and it took about 30 minutes to complete, after completing the questionnaire, a small reward was given as an appreciation token.

2.5. Data analysis

The collected data were analyzed using SPSS/WIN 28.0 version, using the following statistical techniques:

- (1) The general and disease-related characteristics of the subjects, depression, anxiety, stress, treatment crisis, and quality of life related to the COVID-19 pandemic were analyzed as frequencies, percentages, means, and standard deviations.
- (2) Differences in quality of life related to the COVID-19 pandemic according to general characteristics and disease-related characteristics were analyzed by independent *t*-test and one-way analysis of variance (ANOVA).
- (3) Correlations between depression, anxiety, stress, treatment crisis, and quality of life related to the COVID-19 pandemic were analyzed by Pearson's correlation coefficients.
- (4) Factors affecting subjects' quality of life related to the COVID-19 pandemic were analyzed by stepwise multiple regression.

2.6. Ethical considerations

This study was conducted after review and approval (IRB. No: 40525-202112-HR-090-02) by the Institutional Review Board of K University. For the ethical protection of research subjects, the purpose of the study, research methods and procedures, benefits and side effects of participating in the study, withdrawal from the study, confidentiality of personal information, access to mandatory records, and inquiries about the study were fully explained to the subjects, and if they agreed to participate in the study, written consent was obtained and data collection began. The collected data were coded by assigning a unique identification number, stored in a double-locked storage box, and shredded after the mandatory retention period of the data (3 years for consent forms and 5 years for other data) under the Bioethics Act.

3. Results

3.1. General and disease-specific characteristics of subjects

The gender of the 132 subjects was 68 (51.5%) female and 45 (34.1%) aged 60 to 69 years, with a mean age of 56.23 ± 10.04 years. In terms of marital status, 109 (82.6%) were married and 108 (81.8%) were living with a partner. Religious affiliation was reported by 70 (53.0%), and occupation was reported by 74 (56.1%).

The most common type of cancer diagnosed was digestive system cancer with 32 (24.2%), and the most common time since diagnosis was less than a year with 80 (60.6%). The most common cancer stage was stage 4 with 49 (37.1%), and the most common current treatment was surgery with 56 (42.4%). 87 (65.9%) and 78 (59.1%) had been diagnosed with COVID-19 and never quarantined, respectively, and 115 (87.1%) had received a COVID-19 vaccine (**Table 1**).

Table 1. Quality of life related to the COVID-19 pandemic according to general and disease-related characteristics of subjects ($n = 132$)

Characteristics	Categories	n (%) or $M \pm SD$	Quality of life	
			$M \pm SD$	t or F (P)
Gender	Male	64 (48.5)	91.23 \pm 28.18	2.58 (0.011)
	Female	68 (51.5)	78.44 \pm 28.76	
Age (year)	≤ 49	37 (28.0)	77.16 \pm 26.90	1.96 (0.123)
	50 – 59	36 (27.3)	82.97 \pm 27.14	
	60 – 69	45 (34.1)	91.96 \pm 29.81	
	≥ 70	14 (10.6)	87.79 \pm 33.99	
			56.23 \pm 10.04	
Marital status	Unmarried	11 (8.3)	71.73 \pm 26.56	1.27 (0.285)
	Married	109 (82.6)	86.17 \pm 29.03	
	Etc.*	12 (9.1)	82.67 \pm 31.09	
Living arrangement	Alone	24 (18.2)	93.46 \pm 30.59	1.65 (0.101)
	With	108 (81.8)	82.69 \pm 28.52	
Religion	No	62 (47.0)	83.87 \pm 27.10	-0.29 (0.775)
	Yes	70 (63.0)	85.33 \pm 30.92	
Occupation	No	74 (56.1)	87.00 \pm 29.26	1.0 (0.295)
	Yes	58 (43.9)	81.64 \pm 28.84	
Diagnosis	Gastrointestinal cancer	32 (24.3)	92.11 \pm 32.27	1.03 (0.409)
	Breast cancer	25 (18.9)	91.64 \pm 31.08	
	Genital cancer	21 (15.9)	91.00 \pm 30.93	
	Lung cancer	18 (13.6)	90.33 \pm 34.93	
	Head and neck cancer	16 (12.1)	81.22 \pm 24.36	
	Hepatobiliary cancer	14 (10.6)	79.06 \pm 25.39	
	Etc.†	6 (4.6)	76.60 \pm 30.32	
Period since diagnosis (year)	< 1	80 (60.6)	82.76 \pm 30.70	0.45 (0.639)
	1 – < 3	30 (22.7)	88.37 \pm 23.85	
	≥ 3	22 (16.7)	86.41 \pm 30.17	
Stage	≤ 1	35 (26.5)	84.00 \pm 28.66	0.22 (0.881)
	2	30 (22.7)	87.60 \pm 30.60	
	3	18 (13.7)	86.72 \pm 21.64	
	4	49 (37.1)	82.53 \pm 31.37	

Table 1 (Continue)

Characteristics	Categories	<i>n</i> (%) or <i>M</i> ± <i>SD</i>	Quality of life	
			<i>M</i> ± <i>SD</i>	<i>t</i> or <i>F</i> (<i>P</i>)
Type of treatment	Operation	56 (42.4)	81.04 ± 29.11	0.55 (0.651)
	Chemotherapy	55 (41.7)	87.42 ± 29.56	
	Multimodal treatment [‡]	15 (11.4)	88.60 ± 26.32	
	Radiotherapy	6 (4.5)	83.00 ± 29.09	
COVID-19 infection	No	87 (65.9)	84.17 ± 28.70	-0.26 (0.797)
	Yes	45 (34.1)	85.56 ± 30.13	
Social isolation in COVID-19	No	78 (59.1)	82.95 ± 29.55	-0.80 (0.423)
	Yes	54 (40.)	87.09 ± 28.51	
COVID-19 vaccination	No	17 (12.9)	91.24 ± 28.47	1.00 (0.319)
	Yes	115 (87.1)	83.67 ± 29.18	

M, mean; *SD*, standard deviation. *Divorce, separation, separation by death; [‡]Osteosarcoma, thymic carcinoma, leukemia, peritoneal carcinoma; [‡]The use of two or more kinds of treatments such as operation, chemotherapy, radiation therapy, immunotherapy, and hormonal therapy.

3.2. COVID-19 pandemic-related depression, anxiety, stress, treatment crisis, and quality of life

Participants' depression related to the COVID-19 pandemic was 15.14 ± 6.49 out of 30, with a mean score of 2.52 out of 5. Anxiety related to the COVID-19 pandemic was 4.66 ± 5.27 out of 20, with a mean score of 0.93 out of 4. Stress related to the COVID-19 pandemic was 75.83 ± 17.70 out of 105, with a mean of 3.61 out of 5. Treatment crisis related to the COVID-19 pandemic was 78.52 ± 19.95 out of 105, with a mean score of 3.74 out of 5. Quality of life related to the COVID-19 pandemic was 84.64 ± 29.09 out of 138, with a mean score of 3.68 out of 6 (Table 2).

Table 2. The level of depression, anxiety, stress, treatment crisis, and quality of life related to the COVID-19 pandemic (*n* = 132)

Variables	Scale range	<i>M</i> ± <i>SD</i>	Item <i>M</i> ± <i>SD</i>
Depression related to the COVID-19 pandemic	6–30	15.14 ± 6.49	2.5 ± 1.08
Anxiety related to the COVID-19 pandemic	0–20	4.66 ± 5.27	0.93 ± 1.05
Stress related to the COVID-19 pandemic	21–105	75.83 ± 17.70	3.61 ± 0.84
Treatment crisis related to the COVID-19 pandemic	21–105	78.52 ± 19.95	3.74 ± 0.95
Quality of life related to the COVID-19 pandemic	23–138	84.64 ± 29.09	3.68 ± 1.26

M, mean; *SD*, standard deviation.

3.3. Differences in COVID-19 pandemic-related quality of life by general and disease-related characteristics

When we analyzed the differences in quality of life related to the COVID-19 pandemic according to the general characteristics and disease-related characteristics of the subjects, we found that quality of life was only different by gender, with females scoring 78.44 ± 28.76 significantly lower than males scoring 91.23 ± 28.18 ($t = 2.58$, $P = 0.011$; Table 1).

3.4. Correlations between COVID-19 pandemic-related depression, anxiety, stress, treatment crisis, and quality of life

When analyzing the correlations between depression, anxiety, stress, treatment crisis, and quality of life related to the COVID-19 pandemic, we found that quality of life related to the COVID-19 pandemic was significantly positively correlated with treatment crisis ($r = 0.74, P < 0.001$), stress ($r = 0.77, P < 0.001$), anxiety ($r = 0.64, P < 0.001$), and depression ($r = 0.61, P < 0.001$). In addition, treatment crisis related to the COVID-19 pandemic was significantly positively correlated with stress ($r = 0.82, P < 0.001$), anxiety ($r = 0.54, P < 0.001$), and depression ($r = 0.59, P < 0.001$), while stress was significantly positively correlated with anxiety ($r = 0.66, P < 0.001$) and depression ($r = 0.69, P < 0.001$), and anxiety was significantly positively correlated with depression ($r = 0.79, P < 0.001$), indicating positive correlations among all variables (**Table 3**).

Table 3. Correlation among depression, anxiety, stress, treatment crisis, and quality of life related to the COVID-19 pandemic ($n = 132$)

Variables	Depression	Anxiety	Stress	Treatment crisis	Quality of life
	$r (P)$	$r (P)$	$r (P)$	$r (P)$	$r (P)$
Depression	1				
Anxiety	0.79 (< 0.001)	1			
Stress	0.69 (< 0.001)	0.66 (< 0.001)	1		
Treatment of crisis	0.59 (< 0.001)	0.54 (< 0.001)	0.82 (< 0.001)	1	
Quality of life	0.61 (< 0.001)	0.64 (< 0.001)	0.77 (< 0.001)	0.74 (< 0.001)	1

3.5. COVID-19 pandemic-related quality of life factors

Stepwise regression analyses were conducted to identify factors that influenced the subjects' COVID-19 pandemic-related quality of life. Depression, anxiety, stress, treatment crisis, and gender were selected as independent variables, and the categorical variable gender was analyzed as a dummy variable. Before the stepwise regression analysis, autocorrelation and multicollinearity were checked, and the Durbin-Watson correlation coefficient was 2.53, indicating that the independence of the residuals was satisfied, the tolerance limits were 0.28–0.93, which was greater than 0.1, and the variation inflation factor (VIF) was 1.07–3.58, which was less than 10, indicating that there was no problem with multicollinearity among the independent variables.

In the stepwise regression analysis, the regression model explaining the subjects' COVID-19 pandemic-related quality of life was statistically significant ($F = 69.44, P < 0.001$), with an explanatory power of 68.0%. COVID-19 pandemic-related stress ($\beta = 0.41, P < 0.001$) was found to be the most influential factor in influencing COVID-19 pandemic-related quality of life, followed by COVID-19 pandemic-related treatment crisis ($\beta = 0.28, P = 0.002$), COVID-19 pandemic-related anxiety ($\beta = 0.21, P = 0.002$), and gender ($\beta = 0.14, P = 0.009$; **Table 4**). These results indicate that higher levels of COVID-19 pandemic-related stress, treatment crisis, and anxiety were associated with lower COVID-19 pandemic-related quality of life for men than for women.

Table 4. Factors affecting the quality of life related to the COVID-19 pandemic ($n = 132$)

Variables	B	SE	β	t	P	VIF
(Constant)	-7.83	7.55		-1.04	0.302	
Stress	0.68	0.16	0.41	4.39	< 0.001	3.58
Treatment crisis	0.41	0.13	0.28	3.22	0.002	3.03
Anxiety	1.13	0.36	0.21	3.11	0.002	1.75
Gender (male)*	7.97	2.99	0.14	2.67	0.009	1.07

$R^2 = 0.69$, Adjusted $R^2 = 0.68$, $F = 69.44$, $P < 0.001$

B, non-standardization coefficient; SE, standard error; VIF, variation inflation factor; β , standardization coefficient; *Dummy variable (female: 0, male: 1).

4. Discussion

This study was conducted to investigate the extent of COVID-19 pandemic-related depression, anxiety, stress, and treatment crisis among cancer patients, and to determine how these variables affect their quality of life during the COVID-19 pandemic, to provide basic data for the development of nursing interventions that can improve the quality of life of cancer patients in the context of an emerging infectious disease pandemic that could reoccur at any time.

In this study, cancer patients reported a COVID-19 pandemic-related quality of life of 84.64 out of 138 (mean 3.68 out of 6). In a study of the general population using the same instrument as this study, Kim^[5] found a lower COVID-19 pandemic-related quality of life score of 3.99. These results suggest that cancer patients in this study have better quality of life during the COVID-19 pandemic than the general population, as higher scores are interpreted as lower quality of life during the COVID-19 pandemic. Given that cancer patients generally have a lower quality of life than the general population^[12], these results can be considered in several ways. First, we can consider the difference in time points between the two studies. Kim's study was conducted during the fourth wave of the COVID-19 pandemic in 2021 when the number of new COVID-19 cases was at its highest level, and before the introduction of COVID-19 vaccination and treatment for the general adult population. In contrast, this study was conducted in May 2022, after the peak of new COVID-19 cases in Korea and before the start of the gradual return to normal life, which may have reflected the expectation of returning to normal life as the COVID-19 pandemic situation improved, resulting in higher COVID-19 pandemic-related quality of life for cancer patients than for the general population in 2021. This is consistent with a study by Lee^[22] that examined changes in quality of life according to the COVID-19 pandemic situation and found that quality of life tended to worsen as the COVID-19 pandemic situation worsened, indicating that the severity of the COVID-19 pandemic may have a significant impact on quality of life. Therefore, since the COVID-19 pandemic-related quality of life of cancer patients during the pandemic may be worse than that of the general population, future studies should identify how the quality of life of cancer patients changes according to the severity of the pandemic, and develop effective interventions to prevent, maintain, and improve the quality of life of cancer patients.

Another possible explanation for the higher COVID-19 pandemic-related quality of life among cancer patients than the general population is that cancer patients may be less likely to take their discomfort with physical, social, and emotional problems caused by COVID-19 less seriously due to the severity of their health-related quality of life, such as worries about the cancer diagnosis and treatment itself, side effects, and cancer

symptoms. Therefore, we suggest that future research should examine the extent to which cancer patients' health-related quality of life, as well as their COVID-19 pandemic-related quality of life, represent pandemic-related well-being during the pandemic.

In this study, the factors that influenced COVID-19 pandemic-related quality of life in cancer patients were COVID-19 pandemic-related stress, treatment crisis, anxiety, and gender, and the explanatory power of these factors for COVID-19 pandemic-related quality of life in cancer patients was 68.0%. Of these factors, COVID-19 pandemic-related stress was found to have the greatest impact on cancer patients' COVID-19 pandemic-related quality of life, which is consistent with previous studies^[23] that have examined quality of life among COVID-19 survivors and found stress to be the most important factor affecting quality of life.

In this study, cancer patients reported COVID-19-related stress at 75.83 out of 105 (3.61 out of 5), which was higher than the 3.26 score in a previous study of the general population using the same tool^[24]. Cancer patients are considered a high-risk group for COVID-19 due to their compromised immunity from chemotherapy, and COVID-19 vaccination is recommended for cancer patients, especially since COVID-19 infection can be severe and has been reported to have a 30% higher mortality rate than the general population.¹ However, due to controversy over the effectiveness and safety of COVID-19 vaccines, cancer patients have been shown to experience stress in deciding whether to get vaccinated^[25], so outreach and education about the benefits of COVID-19 vaccination should be conducted to increase vaccination rates and reduce stress about the possibility of COVID-19 infection among cancer patients.

In the present study, contagion liability stress, which is the worry that one's own COVID-19 infection will cause their family to become infected with COVID-19, was significantly higher than other stress items. Considering the characteristics of Korean society, which is highly family-oriented and family-oriented^[4], these results may be due to the strong influence of guilt and responsibility for infection and worry that one's own COVID-19 infection may spread COVID-19 to family members. Therefore, in the event of a COVID-19 infection in the family, strict self-isolation, adherence to infection prevention measures, and information and education on the symptoms of infection should be strengthened to reduce stress related to COVID-19 transmission.

The second factor affecting the quality of life during the COVID-19 pandemic in cancer patients was perceived treatment crisis, which is limited by the lack of prior research examining treatment crisis and quality of life during the COVID-19 pandemic in cancer patients, both domestically and internationally, which limits the ability to directly compare results. However, an international study found that 52% of cancer patients had their outpatient appointments changed to telephone or telemedicine during the COVID-19 pandemic, 12% of patients on treatment had their treatment schedule postponed or interrupted, and 62% of these patients reported a sense of treatment crisis, such as fear that their disease would progress or recur due to the change in treatment schedule, which is similar to our findings^[26]. On the other hand, some domestic studies showed that the number of hospital visits for mild illnesses or infectious diseases decreased by 20%–46% after the COVID-19 pandemic, but patients with serious diseases such as cancer, brain disease, and heart disease increased by 1.94% compared to pre-COVID-19, which is different from international studies^[27]. However, this study did not directly investigate patients' sense of treatment crisis, so it is difficult to compare it with the sense of treatment crisis in this study, but it is necessary to investigate whether the COVID-19 pandemic increased worries and sense of crisis about cancer treatment, which led to more hospital visits in future studies.

Previous studies examining the quality of life in cancer patients have found that cancer patients report increased care needs and a sense of crisis that they may not receive adequate care when they experience physical symptoms during cancer treatment, when they do not receive timely treatment for cancer recurrence,

when their physical needs are not met, when they are worried about their cancer prognosis and health, and when they perceive a decrease in the frequency of contact with health care providers ^[28]. This study also found that cancer patients have a high sense of treatment crisis regarding the postponement or interruption of their cancer treatment schedule due to infection with COVID-19, and in particular, among the treatment crisis questions, they most often complain of difficulties in following infection prevention measures that have been strengthened due to the COVID-19 pandemic. In particular, the Korean Society of Critical Illness has suggested improvements such as a shortage of beds for critically ill patients, a lack of manuals for managing critically ill patients, and chaos in the medical care system for the failure to provide adequate care to critically ill patients, including cancer patients, during the COVID-19 pandemic ^[29]. Based on this, to reduce the sense of medical crisis among cancer patients, which is one of the severe diseases, it is necessary to apply strict and strengthened infection prevention guidelines when using hospitals, strengthen the access system for cancer patients to receive continuous medical care with peace of mind, and prepare a manual for managing cancer patients according to the type of cancer diagnosed and the symptoms of cancer if they become infected with COVID-19. In particular, as cancer patients are more likely to become critically ill, establishing infectious disease hospitals with enough professional staff and high-risk medical equipment to care for cancer patients, establishing a close cooperation system between local organizations and infectious disease hospitals to smoothly coordinate the supply and demand of beds, and preparing to support treatment resources can be a good strategy to reduce the sense of urgency of treatment for cancer patients. The third factor affecting cancer patients' quality of life related to the COVID-19 pandemic was anxiety related to the COVID-19 pandemic. These findings are not directly comparable as no prior studies have examined the association between COVID-19 pandemic-related quality of life and COVID-19 pandemic-related anxiety in cancer patients, but they are consistent with previous studies that have examined quality of life in cancer patients and found COVID-19-related anxiety to be a factor in quality of life ^[8].

Previous studies of COVID-19-related anxiety in the general population have shown that infectious disease outbreaks caused by new, unknown pathogens and the lack of a cure increase infectious disease anxiety ^[4], and in this study, cancer patients reported higher levels of anxiety about COVID-19, a new, unknown infectious disease, with a mean score of 3.62 out of 5. To reduce COVID-19-related anxiety, it will be important to provide evidence-based infectious disease information and educate patients on what to do if they experience symptoms of suspected COVID-19 infection so that early detection and treatment can occur. In addition, cancer patients with high levels of COVID-19-related anxiety should be provided with psychological support to understand the causes of their anxiety, provide psychological prevention programs such as emotional support, and provide professional counseling for anxiety symptoms.

The final factor affecting COVID-19 pandemic-related quality of life in cancer patients was gender. These findings were consistent with previous studies examining quality of life among COVID-19 survivors, which found that men had lower pandemic-related quality of life than women ^[23]. This could be explained by the fact that the COVID-19 pandemic reduced the social activities of men, who are more socially active than women, and reduced or limited the number of relationships between people, leading to a relatively higher level of social isolation among men than before the pandemic ^[30], resulting in a further decline in quality of life compared to women. In addition, the socioeconomic changes caused by COVID-19 and the increase in household debt ^[30] may have exacerbated the psychological burden on men who are primarily responsible for the household economy, and the financial losses, reduced income, and loss of economic ability caused by the cancer diagnosis may have further worsened the quality of life of male cancer patients. Therefore, since the quality of life of men may be more negatively affected during the epidemic, it is necessary to identify the changes in the quality of

life of male cancer patients, identify economic factors and psychosocial factors that may affect the quality of life, and provide nursing interventions for patients, such as financial support, social services, and psychological counseling services. However, a previous study^[13] that examined COVID-19 illness attitudes and quality of life in the general population using the same instrument as this study found that women experienced more stress, anxiety, and depression about COVID-19 than men, resulting in lower quality of life, so it is necessary to repeat the study to confirm the association between gender and quality of life related to the COVID-19 pandemic.

In this study, depression related to the COVID-19 pandemic showed a significant correlation with the quality of life of cancer patients, but it did not appear as a contributing factor. These results may reflect the gradual return to normal life and the anticipation of the end of the COVID-19 situation, which occurred in May 2022 when this study was conducted. It is presumed that the low depression scores are related to this and are not significantly impacting the quality of life of patients. However, since the COVID-19 pandemic situation has not yet completely ended, and the era of living with COVID-19 continues to impact society with pandemic-related depression like “COVID blues,” it is necessary to regularly assess depression in cancer patients and continuously monitor changes in depressive symptoms to detect depression in cancer patients early.

The results of this study, which examined the impact of COVID-19 pandemic-related depression, anxiety, stress, and treatment crisis on the quality of life in patients with advanced cancer, showed that COVID-19 pandemic-related stress, treatment crisis, anxiety, and gender were factors affecting the quality of life in cancer patients. These results are significant in that they provide a basis for developing nursing interventions to improve COVID-19 pandemic-related quality of life in cancer patients during an emerging infectious disease epidemic such as COVID-19. In particular, as the treatment crisis was shown to be an influential factor in COVID-19 pandemic-related quality of life in cancer patients, it is expected to provide evidence as a variable for improving COVID-19 pandemic-related quality of life in cancer patients and to promote further research on interventions that can reduce treatment crisis in cancer patients. In addition, it is of great significance that we identified quality-of-life influencing factors in the context of a few COVID-19 pandemic-related quality-of-life studies in Korea.

Limitations of this study include the fact that the study was conducted during the transition period of daily life recovery from the COVID-19 pandemic, so it is necessary to be cautious in interpreting the results and applying them to cancer patients during the COVID-19 pandemic and future pandemics, and the fact that the study was cross-sectional, which limits the ability to infer changes in quality of life in cancer patients reflecting the situation at different times of the COVID-19 pandemic. Furthermore, the reliability and validity of the instrument used to measure treatment crisis related to the COVID-19 pandemic have not been previously validated, and further validation of the instrument is needed. Finally, this study collected data on all cancer patients and did not take into account the diagnosis name, time of diagnosis, and stage of cancer, so there are limitations in generalizing the results to patients of each cancer type and stage, so it is recommended that future studies should investigate the subjects in detail and investigate not only the quality of life related to the COVID-19 pandemic but also the health-related quality of life of cancer patients in general.

5. Conclusions and recommendations

This study was conducted to identify factors affecting COVID-19-related quality of life in cancer patients during the COVID-19 pandemic to provide a basis for developing nursing interventions to improve COVID-19-related quality of life in cancer patients. The results of this study showed that COVID-19 pandemic-related quality of life in cancer patients was significantly and positively correlated with COVID-19 pandemic-related

stress, treatment crisis, anxiety, and depression, and that COVID-19 pandemic-related stress, treatment crisis, anxiety, and gender were significant factors affecting COVID-19 pandemic-related quality of life. Therefore, to improve the COVID-19 pandemic-related quality of life of cancer patients during the pandemic, it is necessary to periodically assess the level of COVID-19 pandemic-related stress, treatment crisis, and anxiety, and to identify the patterns of psychological and emotional changes. In particular, to reduce COVID-19 pandemic-related stress and anxiety, it is necessary to strengthen publicity and education on infectious disease information and the benefits of infectious disease vaccination, and to educate patients on infection prevention measures and what to do if an infectious disease occurs, so that early detection and treatment of infectious diseases can be achieved. It will also be necessary to provide psychological support to cancer patients in need of psychological and emotional interventions, including the provision of psychological prevention programs and access to professional counseling.

Based on the above findings, we make the following recommendations: First, there is little prior research on factors affecting pandemic-related quality of life in cancer patients, so replication studies are needed to generalize the findings of this study. Second, since this study was conducted as a cross-sectional study and could not reflect the changes in the COVID-19 pandemic situation, it is necessary to conduct a longitudinal study to identify the psychological reactions and quality of life of cancer patients according to the changing patterns of the pandemic situation and to identify the influencing factors by time. Third, we propose a study that identifies the quality-of-life influencing factors by separating patients by cancer type and stage, considering the diagnosis name, time of diagnosis, and stage of cancer, and a study that investigates the health-related quality of life of cancer patients.

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Disclosure statement

The authors declare no conflict of interest.

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