

ORIGINAL ARTICLE

Psychological distress of cancer patients caused by treatment delay during the COVID-19 pandemic in China: A cross-sectional study

Yingjun ye^{1,2} | Jin Wang^{1,2} | Shuping Cai^{1,2} | Xiaowei Fu^{1,2} | Yongling Ji^{1,2}

¹The Cancer Hospital of the University of Chinese Academy of Sciences & Zhejiang Cancer Hospital, Hangzhou, China

²Institute of Basic Medicine and Cancer (IBMC), Chinese Academy of Sciences, Hangzhou, China

Correspondence

Yongling Ji and Xiaowei Fu, The Cancer Hospital of the University of Chinese Academy of Sciences & Zhejiang Cancer Hospital, Hangzhou, 310022, China.
Email: jiyl@zjcc.org.cn and fuxw@zjcc.org.cn

Abstract

Objective: The current study sought to explore the impact of treatment delay on the mental health for patients with cancer during the 2019 coronavirus disease (COVID-19) pandemic.

Methods: Travel restrictions were imposed in most areas of the country between 23 January 2020 and 25 February 2020 owing to the COVID-19 epidemic. Travel restrictions were lifted from 26 February 2020 to 12 March 2020. The number of new confirmed cases significantly reduced after 12 March 2020. Study participants, comprised of individuals from three distinct groups: (1) 835 cancer patients who attended Zhejiang Cancer Hospital between 26 February 2020 and 12 March 2020; (2) 185 healthy volunteers recruited between 26 February 2020 and 12 March 2020; (3) 168 cancer patients who attended the hospital during the non-epidemic period (after 12 March 2020). Two outcome measures including patients' post-traumatic stress responses and general psychological distress (GPD) were assessed using the Chinese versions of the Impact of Events Scale-Revised and the Kessler Psychological Distress Scale (K10). Treatment delay was assessed via counting the time interval from diagnosis to treatment initiation, or from planned treatment date to actual date of therapy. Communication satisfaction was evaluated via a self-report questionnaire. An independent sample *t*-test or Wilcoxon rank sum test was used for comparison. Statistical analysis included Chi-square test, Mann-Whitney test and multivariate logistic regression.

Results: All 1188 participants (835 patients with cancer and 185 controls during the outbreak, and 168 patients with cancer during the non-epidemic period) completed and submitted the questionnaires. A positive association was observed between treatment delays and increased GPD levels (OR 1.716; 95% confidence interval, CI 1.254–2.348; $p = 0.001$) as well as posttraumatic stress disorder (PTSD) symptoms (OR: 1.545, 95% CI: (1.166–2.047), $p = 0.002$). Patients who reported good communication with their doctors showed a significantly lower risk of GPD (OR: 0.526, 95% CI (0.348–0.794), $p = 0.002$) and PTSD (OR: 0.683, 95% CI (0.490–0.951), $p = 0.024$) compared with patients who reported unsatisfactory communication or had no contact with their doctors. Multivariate logistic regression analysis

showed that treatment at a local hospital, treatment delays and unsatisfactory or no communication with cancer-care professionals were significantly correlated with severe GPD and PTSD symptoms of patients (all $p \leq 0.05$).

Conclusion: The findings indicate that cancer patients who underwent treatment delays during the COVID-19 pandemic may become vulnerable to psychological distress. The results showed that effective communication with doctors and cancer-care professionals during outbreak significantly reduces GPD levels and PTSD symptoms.

KEYWORDS

cancer, COVID-19, depression, logistic model, mental health, oncology, post-traumatic stress disorder, psychological distress, treatment delay

1 | BACKGROUND

The 2019 coronavirus disease (COVID-19) caused by SARS-CV-2 virus was reported in China and rapidly spread throughout the globe.^{1,2} COVID-19 was initially reported in the Hubei province of China in November 2019 and has been successfully contained in China through the implementation of strict self-enforced and government-enforced quarantine measures nationwide. Citizens were instructed to frequently wash their hands, wear facemasks and avoid sharing personal items (such as towels, drinking cups or cutlery) between 23 January 2020 and 25 February 2020. Several provinces and cities, including Zhejiang province, imposed travel restrictions to prevent the spread of the virus. Public transportation was modified and several cities adopted measures to control movement of people. Outdoor restrictions were implemented to more than half of China's population (approximately 760 million people), including thousands of cancer patients.³ In addition, most medical resources were diverted to COVID-19 patients, routine clinical care and elective procedures (including anti-tumor procedures) were temporarily paused. The mandatory measures were implemented from late January 2020 to 26 February 2020. Notably, travel restrictions were lifted after 26 February 2020. The number of new confirmed cases significantly reduced after 12 March 2020.

Although the travel restrictions helped in controlling the outbreak, they were associated with negative effects, including treatment delay.⁴ Additionally, hospitals have focused all clinical and organizational attention on COVID-19, as a result, many patients with cancer could not receive treatment on time.^{5,6} Cancer causes psychosocial distress, which may be exacerbated by delays in treatment. Especially, newly diagnosed patients seem to have higher levels of anxiety when they encounter treatment delay.^{7,8} Furthermore, studies report that cancer patients have a higher risk of developing several psychological conditions when faced with public health emergencies and other unprecedented events.^{9,10} Thus, Individuals with cancer have endured psychological pressure during the COVID-19 epidemic, which may lead to psychological distress, such as anxiety and irritability.^{11,12}

Psychological distress has significant implications for treatment course and outcomes. Patients with depression are more likely to exhibit low compliance to medical treatment compared with those without depression, thus increasing mortality rates.¹³⁻¹⁵ While satisfactory communication between physicians and patients may help to alleviate the psychological distress during the COVID-19 epidemic, as previous studies reported that good communication between physicians and patients offers better emotional support to patients, which results in lower depression scores and greater adherence to treatment regimens.^{16,17}

As only a few published studies have explored a potential relationship between psychological distress and treatment delays in cancer patients during the COVID-19 pandemic. In this study, cancer patients facing prolonged wait times for treatment during the COVID-19 pandemic were hypothesized to undergo substantial levels of psychosocial distress. The present study was thus conducted to explore the effect of treatment delay on levels of psychological distress in cancer patients during the pandemic.

2 | METHODS

2.1 | Ethical considerations

The research protocol used in this study was approved by the Ethics Committee of Zhejiang Cancer Hospital (IRB-2020-134(Ke)).

3 | PARTICIPANTS

Patients diagnosed with cancer before 23 January 2020 and admitted to Zhejiang Cancer Hospital between 26 February 2020 and 12 March 2020 were recruited in this study. The inclusion criteria were as follows: (1) Age more than 18 years old. (2) Mentally healthy before 23 January 2020. Mentally healthy here is defined as follows: hadn't been diagnosed with mental disease (such as depression or anxiety disorder) by a psychiatrist, nor had a

medication history of mental diseases (including sleeping pills, sedatives, antidepressants, and other medications that will influence patients' mental status) during the past 6 months. Besides, two gender- and age-matched control groups were also recruited: (1) In order to compare between cancer patients and healthy controls, healthy volunteers without cancer history were recruited during the same period in nearby housing estates and streets of the hospital. (2) In order to investigate the impact of the epidemic on psychological health, cancer patients who didn't undergo treatment delay were recruited in the non-epidemic period (after 12 March 2020). All participants signed an electronic consent form before participation, and were asked to fill out a questionnaire. Information on the study and invitations to participate were posted on the hospital's Department of Outpatient Care site.

3.1 | Measures

Data on understanding of the COVID-19 severity and counter-measures were collected using a self-report questionnaire. In addition, basic individual information (such as sex, age, educational level and family income) was collected through a questionnaire. Questionnaires were handed directly to patients willing to participate, and participants send the filled questionnaires through WeChat (a messaging and social media app).

Self-report questionnaire comprised items developed and tailored for this study. The survey consisted of 52 multiple-choice questions in the first section of the survey. The section comprised open-ended questions to provide respondents with the opportunity to describe aspects of quarantine that were most difficult for them. This section allowed subjects to provide additional comments on their unique experiences.

The second section of the survey included questions on the levels of knowledge and understanding of the severity of COVID-19 by participants and whether they were aware of counter-measures to prevent occurrence of COVID-19. Participants were required to answer the following questions: "Do you agree that staying at home is very important for protection from the virus?" and "Do you agree that wearing a mask is very important for protection from the virus?" to explore their perspective on the restrictions imposed by the government. The third section of the survey included items that assessed psychological and social variables. Participants need approximately 9 minutes to fill the entire questionnaire. Treatment delay was defined as a delay of longer than 7 days between diagnosis and the first treatment, or between actual date of therapy and planned treatment date. Communication satisfaction or not between patients and doctors may influence patients' psychological state, especially when treatment delay happened. Thus, communication satisfaction was also assessed via patients answering a question in the questionnaire: "do you communicate well with your doctors?" When the answer was "yes", we supposed that patient had satisfactory communication with the doctor. Otherwise, we supposed that patient had unsatisfactory communication or had no contact with the doctor.

3.2 | Psychological evaluation

Two outcome measures including posttraumatic stress responses (PTSR) and general psychological distress (GPD), were assessed using the Chinese versions of the Impact of Events Scale-Revised (IES-R) and the Kessler Psychological Distress Scale (K10),¹⁸ respectively to explore the psychological status of subjects. Impact of Events Scale-Revised is a 22-item self-administered questionnaire (score range: 0–88 points) used to evaluate three response sets of PTSR, including: intrusion, avoidance and hyperarousal following a traumatic event.¹⁹ A score of 25 or higher on the IES-R scale indicates a high PTSR level as described in a previous study.²⁰

K10 is a 10-item self-administered questionnaire (score range: 10–50 points) developed by Kessler and is widely used to evaluate GPD.^{21–23} K10 scale uses a 24/25-point cutoff value as a screening test for psychological illnesses.¹⁹ Therefore, the respondents who scored 25 points or higher in the present study were assigned to the high-GPD group. Reliability and validity of the two scales have been confirmed in studies using Chinese participants.^{18,24} Cronbach's alphas for the K10 and IES-R scales were 0.80 and 0.89, respectively.^{18,24}

Scores ≥ 25 points on the K10 and IES-R were used to estimate the prevalence of GPD and posttraumatic stress disorder (PTSD), respectively.

3.3 | Statistical analysis

Data were presented as mean value \pm standard deviation, median (IQR) or percent. Wilcoxon rank sum test was used for comparison of patients during the pandemic period and healthy volunteers/patients during the non-pandemic period, as well as comparison between subgroups. Chi-square test was used to explore the relationship between K10 and IES-R scores and independent variables, such as gender, age and combined annual household income. Multiple logistic regression analyses were conducted to explore the association between basic characteristics of participants and psychological status. $P < 0.05$ was considered statistically significant. Intelstatinal Business Machines Corporation, Statistical Package for the Social Sciences Statistics for Windows version 24 was used for all statistical analysis.

4 | RESULTS

4.1 | Basis characteristics of participants

A total of 1188 participants agreed to participate in this study (100% response rate), and all subjects completed a self-report questionnaire on psychological distress. Details on participant characteristics are presented in Tables 1 and 2. The median age of participants was 57 years (range: 18–88 years). 73.5% of the participants were less than 65 years, 91.3% were married, 22.8% had religious beliefs. As for education and income, 13.7% of the participants were at college

TABLE 1 Proportions of cases of different tumor types

Tumor type	<i>n</i> = 835 COVID-19 outbreak	Percentage (%)	<i>n</i> = 168 non-epidemic period	Percentage (%)
Lung cancer	193	23.1	42	24.9
Colorectal cancer	108	12.9	13	7.7
Breast cancer	103	12.3	7	4.1
Cervical cancer	41	4.9	0	0
Gastric cancer	50	6.0	17	10.1
Ovarian cancer	41	4.9	0	0
Esophageal cancer	49	5.9	13	7.7
Lymphoma	33	4.0	1	0.6
Liver cancer	30	3.6	7	4.1
Head and neck cancers	60	8.4	35	20.7
Pancreatic cancer	19	2.3	1	0.6
Endometrial cancer	15	1.8	0	0
Malignant melanoma	4	0.5	2	1.2
Biliary tract cancer	3	0.4	6	3.6
Benign tumor	14	1.7	8	4.7
Soft tissue sarcoma	9	1.1	8	4.7
Malignant tumor of the urinary tract	6	0.7	1	0.6
Other malignant tumors	24	2.9	7	4.1
Undiagnosed	23	2.8	0	0

level or higher, and 48.7% participants had a combined household income > Renminbi (RMB) 50000.

4.2 | Perception towards precautionary measures against 2019 coronavirus disease

Participants showed good compliance with the protective measures against COVID-19. Most participants (99.6%) understood that staying at home reduces the risk of infection, they also agreed that it was very important or quite important to wear a facemask and frequently wash hands. Approximately 99.3% of the participants agreed that community management was very important or quite important. Moreover, 99.3% reported that the Wuhan lockdown and travel restrictions were effective in controlling the COVID-19 pandemic. Although 78.9% of participants thought the control measures were associated with negative effects and continued to affect their works and daily life, 87.2% believed they could overcome these negative effects.

5 | PSYCHOLOGICAL IMPACT AMONG THE THREE GROUPS

Impact of Events Scale-Revised and K10 scores for cancer patients during the epidemic period and healthy volunteers were compared. The median IES-R score for patients with cancer was 25 (IQR 15,36)

whereas the median IES-R for healthy volunteers (controls) was 22 (IQR 11, 34.5), indicating a significantly higher IES-R score of cancer patients compared with healthy volunteers ($p = 0.011$). However, the median K10 scores were not significantly different between the patients with cancer and healthy volunteers (19 (IQR 14,25) versus 20 (IQR 14,26.5), respectively, $p = 0.462$).

Data for 168 patients diagnosed with cancer during the non-epidemic period were collected for comparisons. These patients had not encountered a treatment delay of more than 7 days. The median IES-R score for the patients undergoing treatment during the non-epidemic period was lower compared to the IES-R score of patients undergoing treatment during the epidemic period (15 (IQR 5,29) versus 25 (IQR 15,36), $p < 0.001$). However, the median K10 scores were not significantly different between the two patient groups (19 (IQR 14,25) versus 19 (IQR 14,25), $p = 0.919$).

6 | SUBGROUP ANALYSES OF PSYCHOLOGICAL IMPACT WITHIN PANDEMIC PERIOD PATIENTS

Subgroup analyses of pandemic period patients showed that the median K10 score for patients without treatment delays was significantly lower compared with the K10 score for patients with treatment delays (19 (IQR 13,23) versus 20 (IQR 14,27), $p = 0.001$). This indicates that delay in treatment was associated with the occurrence

TABLE 2 K10 and Impact of Events Scale-Revised (IES-R) scores in different groups of pandemic period patients

Characteristic	N (%)	Median K10 score (IQR)	<i>p</i>	Median IES-R score (IQR)	<i>p</i>
Age (years)			0.004		0.330
≥65	221 (26.5)	18 (13, 23)		25 (14,34.5)	
<65	614 (73.5)	20 (14,26)		25.5 (15,37)	
Stage			0.044		0.061
I	59 (7.5)	18 (12,23)		25 (15,36)	
II – IV	712 (85.3)	20 (14,26)		26 (15,37)	
Unknown	64 (7.2)	20 (15,26)		26 (15,36)	
Gender			0.168		0.268
Males	391 (46.8)	19 (13,25)		25 (14,36)	
Females	444 (53.2)	20 (14,25)		26 (15.25,36.75)	
Religious beliefs			0.285		0.188
No	645 (77.2)	19 (13,25)		25 (14,36)	
Yes	190 (22.8)	20 (14.75,26)		26 (17,39.25)	
Education			0.308		0.298
College	114 (13.6)	18.5 (13,24.25)		23.5 (13.75,34)	
High school	721 (86.3)	20 (14,25.5)		26 (15,37)	
Income (USD)			0.685		0.658
≥50,000	407 (48.7)	20 (14,25)		25 (15,35)	
<50,000	428 (51.3)	19 (13,26)		25 (14,37)	
Diagnosed			0.154		0.151
Confirmed	768 (92.0)	20 (14,25)		26 (15,37)	
Not yet confirmed	67 (8.0)	17 (13,23)		24 (14,33)	
Treatment delays			<0.001		<0.001
No delays	315 (37.7)	19 (13,23)		23 (11,34)	
Treatment delays	520 (62.3)	20 (14,27)		26 (17,38)	
Treatment delay			0.002		0.002
No delays	315 (36.4)	19 (13,23)		23 (11,34)	
<3 weeks	304 (36.4)	20 (14,26)		26 (16,37)	
≥3 weeks	216 (25.9)	20 (14,28)		26 (18,38)	
Local hospitals or cancer center			<0.001		0.005
Cancer center	553 (66.2)	19 (13,24)		24 (14,35)	
Local hospitals	282 (33.8)	21 (15,18)		27 (18,39.25)	

Abbreviations: K10, Kessler Psychological Distress Scale; IES-R, Impact of Event Scale-Revised. *n* = 835.

of PTSD symptoms. Meanwhile, the median IES-R score for patients without treatment delays was significantly lower relative to the IES-R score for patients with treatment delays (23 (IQR 11,34 vs. 26 (IQR 17,38), respectively; *p* = 0.001). Those results suggested that treatment delay in the pandemic period was correlated with increased GPD and PTSD symptoms. As for combined annual household income, educational level, gender, religious beliefs or a confirmed diagnosis of cancer, no association was observed between any of them and GPD or PTSD symptoms (Table 2).

Some of the patients (33.8%) received cancer care at local community hospitals (hereafter referred to as local hospitals) and not at a cancer center during the epidemic. Patients who attended a local hospital for treatment showed a higher median K10 score compared with the patients who were treated at a cancer center (21 (IQR 15,18) versus 19 (IQR 13,24), *p* < 0.001). In addition, patients treated from a local hospital showed a higher median IES-R score relative to patients treated at a cancer center (27 (IQR 18, 39.25) versus 24 (IQR 14, 35), *p* = 0.005).

7 | IMPACT OF COMMUNICATION SATISFACTION ON THE PSYCHOLOGICAL STATE

In the current study, 66.1% of cancer patients were in contact with cancer-care professionals during the outbreak. Out of the 66.1% of patients, 18.0% contacted cancer-care professionals through mobile phones, 22.0% through office numbers, 22.2% through WeChat or other social media platforms and 4.0% through other methods. A total of 21.6% of the cancer patients reported that they had good communication with their doctors, and had lower IES-R scores. The patients who reported good communication with their doctors showed a significantly lower median IES-R score compared with that of patients who reported unsatisfactory communication or had no contact with their doctors (23 (IQR 14,32) versus 26 (IQR 15,28); $p = 0.012$). In addition, patients with satisfactory communication with medical professionals exhibited significantly lower median K10 score compared with had unsatisfactory communication or had no contact with medical professionals (19 (IQR 14,23) versus 20 (IQR 13,26), $p = 0.034$). These findings indicate a positive association between effective communication and reduced GPD and PTSD.

8 | UNIVARIATE AND MULTIVARIATE ANALYSES OF RISK FACTORS FOR GENERAL PSYCHOLOGICAL DISTRESS AND POSTTRAUMATIC STRESS DISORDER IN PANDEMIC PERIOD PATIENTS

Univariate analysis in pandemic period patients disclosed that treatment delay was significantly associated with presence of GPD (OR 1.716, 95% CI: (1.254–2.348) $p = 0.001$) and PTSD (OR: 1.545, 95% CI: (1.166–2.047), $p = 0.002$). Other determinants significantly associated with the presence of GPD included age (<65 years), receiving treatment in a local hospital and unsatisfactory or no communication with cancer-care professionals. All the factors except age were significantly associated with PTSD symptoms in patients.

Multivariate logistic regression analysis was performed to further explore factors associated with the presence of GPD and PTSD symptoms. The presence of GPD or PTSD symptoms were set as dependent variables. Age, communication with cancer-care

professionals, treatment delays and receiving treatment in a local hospital were set as independent variables. The results showed that age >65 years, receiving treatment in a local hospital, treatment delays, as well as unsatisfactory or no communication with cancer-care professionals were significantly correlated with the presence of GPD (Table 3). All these factors except age were significantly correlated with the presence of PTSD symptoms in the patient group (Table 4).

9 | DISCUSSION

The COVID-19 pandemic changed our way of life greatly, its influence is profound and should not be neglected. For those cancer patients, the pandemic may cause a longer wait time to treatment, which not only influences their treatment courses but may also have a negative impact on their mental health. In the current study, we discovered that the treatment delay caused by travel restriction during the COVID-19 pandemic period was associated with increased PTSD and GPD of cancer patients, indicating that patients who experienced treatment delay were likely to report enhanced PTSD and GPD. Meanwhile, such psychological distress could be diminished via good communications with doctors. Besides, a age ≥ 65 and treatment at cancer center rather than local hospital were also associated with alleviated distress. Our study provides a way for optimizing treatment courses for cancer patients during the COVID-19 pandemic.

Patients with cancer may experience psychological distress after diagnosis,^{25,26} and they may exhibit significant distress owing to the negative effects of the COVID-19 pandemic.²⁷ Measures to control the spread of COVID-19 have been implemented throughout the world. These measures including travel restrictions have delayed anti-tumor treatment. Previous studies report that delayed treatment is associated with significant psychological distress.²⁸ A previous meta-analysis demonstrated that medical patients with depression were more likely to have low compliance on taking prescribed medications, and are likely to make drastic lifestyle changes compared with patients without depression.¹⁵

The findings of the present study showed that a significant proportion of the patients were distressed, as evidenced by the

TABLE 3 Multivariate and univariate analyses of general psychological distress (GPD) levels using a backward logistic regression model in pandemic period patients

Parameter	Univariate analysis		Multivariate logistic regression analysis	
	Odds ratio (95% CI)	<i>p</i> -value	Odds ratio (95% CI)	<i>p</i> -value
Age (≥ 65 years vs. <65 years)	0.644 (0.445–0.931)	0.019	0.676 (0.464–0.984)	0.041
Communication (effective vs. unsatisfactory or no communication)	0.526 (0.348–0.794)	0.002	0.558 (0.367–0.849)	0.006
Treatment delays (delays vs. no delays)	1.716 (1.254–2.348)	0.001	1.721 (1.228–2.413)	0.002
Treated in a local hospital (vs. a cancer center)	1.705 (1.238–2.350)	0.001	1.705 (1.238–2.350)	0.001

Note: Analysis comprised several individual and clinical risk factors for GPD ($n = 835$).

Abbreviations: GPD, general psychological distress; β , regression coefficient; CI, confidence interval.

TABLE 4 Multivariate and univariate analyses of posttraumatic stress disorder (PTSD) symptoms using a backward logistic regression model in pandemic period patients

Parameter	Univariate analysis		Multivariate logistic regression analysis	
	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value
Communication (effective vs. unsatisfactory or no communication)	0.683 (0.490–0.951)	0.024	0.715 (0.511–1.002)	0.051
Treatment delays (delays vs. no delays)	1.545 (1.166–2.047)	0.002	1.515 (1.139–2.013)	0.004
Treated in a local hospital (vs. a cancer center)	1.545 (1.155–2.065)	0.003	1.521 (1.135–2.040)	0.005

Note: Analysis comprised several individual and clinical risk factors for PTSD ($n = 835$).

Abbreviations: PTSD, posttraumatic stress disorder; β , regression coefficient; CI, confidence interval.

proportion that exhibited symptoms of PTSD and depression. In addition, a trend toward increasing symptoms of PTSD was observed among younger cancer patients implying that this subgroup may require additional measures to improve psychological status.

The COVID-19 pandemic delayed treatment appointments and aggravated the conditions of patients. The findings of the present study indicated that the levels of distress among patients increased when their treatments were delayed for more than 7 days, compared with a delay that lasted 7 days or less. Association between worrying about treatment delays and patients' psychological distress can be attributed to a lack of psychosocial support.²⁹ Notably, effective communication with doctors and cancer-care professionals was associated with reduced GPD and PTSD. These results indicate that the management of psychological conditions among patients with cancer is important after a virus outbreak. Doctors treating patients with cancer after a breakout should screen for and monitor patients' psychological distress. In addition, they should conduct regular physical examinations necessary for these patients.³⁰

The correlation between an effective communication in patients with their doctors and patients' emotions is frequently reported.^{16,17} For those who had regular opportunities to effectively communicate with their doctors during the delay, they described this communication alleviates their distress, improves their emotions, and allays their fears of disease progression, and they are more willing to adhere to treatment plan. Conversely, many participants described similar terrible experiences where they had bad communication, or lose contact with their doctors, with some even unaware of their surgery being delayed. Such bad experiences made them continually depressed or anxious, and deeply worried about disease progression. Worse more, they felt neglected by their doctors, and finally, some patients become distrusting of their doctors and not willing to adhere treatment plan strictly. Therefore, both cancer patients and doctors should communicate with each other actively and regularly, especially when facing treatment delays.

In the present study, we also found that younger age was associated with a higher risk for PTSD relative to older age. These findings are consistent with results from previous studies. Studies report that older participants were associated with lower levels of PTSD compared with the levels in younger participants.^{29,30} These findings imply that younger patients with cancer may have experienced significant psychological distress and were more susceptible to PTSD

compared with older patients.³¹ The potential reasons for younger patients to experience more distress during the pandemic might be that: (1) Younger patients have less life experience compared with older patients, they tend to be more vulnerable and have an unstable mentality when facing troubles. (2) Younger patients are less experienced in solving problems, in this situation they are easy to become panic, while older patients may develop more systematic coping strategies to confront the traumatic events, so they tend to keep calm down.

10 | STUDY LIMITATIONS

This study had a few limitations. Firstly, selection effects may have occurred among the participants. The respondents required access to a smartphone to participate in the study, implying that participants included in the study may be younger and had higher socioeconomic status than the general population. As age and socioeconomic status may influence the result, our study may be influenced by selection effects.³² In addition, a cross-sectional study design was used in this study which restricts causal interpretations.

11 | CLINICAL IMPLICATIONS

The findings indicated that patients with cancer are likely to have considerable psychological distress during the COVID-19 pandemic in form of GPD and PTSD symptoms. Treatment delays are common during the COVID-19 pandemic and can cause psychological distress. Effective communication with doctors and cancer-care professionals can significantly reduce GPD and PTSD symptoms. Therefore, public health professionals, cancer-care professionals, psychiatrists and psychologists should implement measures to alleviate psychological distress in cancer patients during pandemics.^{33,34}

12 | CONCLUSION

The findings of the present study indicate that patients with cancer exhibited psychological distress during the COVID-19 pandemic mainly due to treatment delays. Notably, effective communication

with doctors and cancer-care professionals during outbreak reduced GPD and PTSD symptoms in patients.

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CONFLICT OF INTEREST

No conflict of interest exists in the submission of this manuscript. The final manuscript draft was approved by all authors for publication.

AUTHOR DISCLOSURE

Author Yinjun Ye wrote the protocol, analyzed data and wrote the first manuscript draft.

Author Yonglin Ji and Xiaowei Fu designed the study, wrote the protocol and revised the manuscript.

Authors Jin Wang performed literature searches and statistical analyses.

Authors Shuping Cai performed statistical analysis.

Authors Yonglin Ji revised the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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