Brief Report

DOI: 10.5582/bst.2022.01251

Needs of cancer patients during the SARS-CoV-2 Omicron lockdown: A population-based survey in Shanghai, China

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SUMMARY The aim of this study was to investigate the medical and healthcare needs of cancer patients during the Shanghai lockdown due to the SARS-CoV-2 Omicron pandemic. From April 15 to April 21, 2022, 4,195 cancer patients from every district in Shanghai were surveyed using quota sampling via an online platform. The questionnaire consisted of three main parts: demographic and sociological data, disease diagnosis, and different dimensions of patients' needs. Correlation analysis was used to examine the relationship between participants' need scores in each dimension, and generalized linear regression models were used to analyze the factors influencing patients' need scores. The mean age of participants was 63.23 years (SD: 7.43 years), with more female than male participants (80.38% *vs*. 19.62%). Among participants, the three leading groups of patients were those with breast cancer (39.02%), colorectal cancer (12.82%), or tracheal and bronchial lung cancer (10.23%). Social support, dietary/nutritional support, and psychological counselling ranked as the top three needs of cancer patients. In addition, vaccination against SARS-CoV-2 may reduce psychological anxiety in cancer patients. Compared to participants who had never received the SARS-CoV-2 vaccine, participants who had received one, two, or three doses of the vaccine were respectively 36% (odds ratio (OR): 0.64, 95% confidence interval (CI): 0.56-0.73), 38% (OR: 0.62, 95% CI: 0.59-0.54), and 37% (OR: 0.63, 95% CI: 0.60-0.66) less likely to have an increased need for psychological counseling. In light of constraints on offline medical resources for cancer patients during the lockdown, the current authors have begun to re-examine the universal accessibility and spread of telemedicine in the future. In addition, immune barriers can be established for cancer patients and vaccination guidelines for different disease stages, tumor types, and treatment regimens can be explored in detail.

Keywords Shanghai lockdown, SARS-CoV-2 Omicron, cancer patients, needs

1. Introduction

The SARS-CoV-2/COVID-19 Omicron variant was first identified in November 2021 in Botswana and South Africa (*1*). Although immunological and clinical data did not provide definitive evidence, the omicron variant displayed early signs of high transmissibility, reduced severity, and immune escape, potentially increasing the difficulty of controlling the pandemic (*2,3*). In late February 2022, a wave of omicron BA.2 infection rapidly appeared in Shanghai, China. Shanghai is one of the most important international economic, financial, trade, and shipping centers in China, with a resident population of more than 25 million. According to the Shanghai Municipal Health Commission, from February 26 to May 31, 2022, 58,000 cases were reported, and 588 people died with or from the omicron variant of SARS-CoV-2 (*4*). To reduce the spread of the pandemic, Shanghai imposed a lockdown with movement restrictions, social distancing, and home confinement starting April 1, 2022.

Cancer patients endured multiple challenges in terms of infection risk, prognostic outcomes, and tumor recurrence during the COVID-19 pandemic (*5*). Huang *et al*. (*6*) reported that the 30-day mortality was higher in COVID-19 patients with cancer and that patients with both cancer and cardiovascular disease (CVD) have significantly increased Pro-BNP and D-Dimer levels. Dai *et al*. (*7*) provided evidence that COVID-19 patients with cancer had a higher risk for all severe outcomes. Patients with hematologic cancer, lung cancer, or with metastatic cancer (stage IV) had the highest frequency of severe events. In addition, delays in early tumor screening, detection, monitoring of recurrence, and treatment may potentially have a negative impact on the outcomes for cancer patients during the COVID-19 pandemic. An observational/modeling study reported

that delays in surgery for incident cancers of 3-6 months would decrease life-years gained by said surgery by 19% and 43%, respectively, and by 26% and 59% when considering resource-adjusted life-years gained (*5,8*).

Shanghai had 79,000 new cancer cases and 490,000 existing patients in 2021, with an overall prevalence of 3% (*9*). The number of patients is correlated with the healthcare resources required by the patient. Unfortunately, the strict lockdown in Shanghai disrupted the normal life of the public, and medical resources were overwhelmed by patients with the Omicron variant of SARS-CoV-2. Since some cancer patients are elderly and there is no immune barrier, they may face many difficulties in such dire situations. Formulating supportive care strategies for cancer patients will be on the agenda as soon as it is feasible (*10,11*). However, few studies have surveyed the needs of cancer patients and few have provided valid evidence on related topics.

To investigate the medical and healthcare needs of cancer patients during the Shanghai lockdown, 4,195 cancer patients from every district in Shanghai were surveyed using a quota sample. The hope is that this study will provide evidence to support the formulation of scientific plans for public health emergencies in megacities in the future. As the pandemic rages around the world, further analysis of the impact of COVID-19 on cancer patient needs and healthcare delivery systems will be essential in order to better tailor the management of cancer patients and minimize disruptions to cancer care.

2. Materials and Methods

2.1. Study design and data collection

From April 15 to April 21, 2022, cancer patients in 16 districts in Shanghai were surveyed with the help of volunteers from the Shanghai Cancer Rehabilitation Club during the Shanghai lockdown. Quota sampling, which improves the representativeness of a sample by determining the sample size of various (tiers) units and randomly selecting samples within the quota, was used. Surveyors were recruited and trained in each district of Shanghai. Three hundred questionnaires were distributed to each district in Shanghai *via* an online platform, and the quality of data was managed by filtering IPs, time limits, *etc*. After all the questionnaires were returned by the surveyors, members of the research team checked them again. A total of 4,900 questionnaires were distributed in this study, 4,221 were returned, 5 invalid questionnaires were excluded, and 4,195 questionnaires were finally included in the statistical analysis, for a valid response rate of 99.4%.

Inclusion criteria for study participants were: *i*) adults over the age of 18 who have been diagnosed with cancer; *ii*) in the stable or convalescent stage but not in the acute stage; *iii*) and residing in Shanghai for the last three months.

This study was approved by the ethics committee of the Shanghai Health and Health Development Research Center (Shanghai Institute of Medical Science and Technology Information), approval no.: SHDRC2022005. All participants provided written informed consent. The details of the questionnaire can be obtained by contacting the corresponding author.

2.2 Questionnaire

The questionnaire on the needs of cancer patients during public health emergencies used in this study was designed by the research team based on the literature and advice from relevant experts (*12-14*). The questionnaire has three parts: *i*) demographic and sociological data, including age, gender, and level of education; *ii*) disease diagnosis, including disease diagnosis, staging, and the treatment plan; and *iii*) patient needs in 9 dimensions, namely outpatient and emergency medical care, drug supply, nursing care, online medical care, COVID-19 infection concerns, dietary/nutritional support, approval to visit a medical facility for treatment, and psychological counseling. Since different numbers of questions needed to be designed in accordance with the specifics of each dimension to reflect the patient's actual situation, weighted factor scoring was used to evaluate the need score in each dimension, and the total need in each dimension was given a score of 3 points. The magnitude of the score reflects the degree of participant need.

2.3 Statistical analyses

Quantitative data (such as need scores) with a normal distribution were expressed as the mean ± standard deviation (SD). Qualitative data (such as gender and marital status) were expressed as a value or percentage. A correlation analysis was performed using a nonparametric rank sum test on the need scores of different categories of patients. Dichotomous variables (such as gender) were analyzed using a *t*-test; three or more categories were analyzed using variance analysis or a nonparametric test.

Cancer patients' need scores in different dimensions served as the dependent variable, and a set of variables served as independent variables based on a review of the results of multiple studies and previous univariate analyses. Multivariate linear regression analysis was performed using a generalized linear regression model.

All statistical analyses in this study were performed using the software IBM SPSS Statistics 21.0 and R Studio 4.0.2, and $p < 0.05$ was considered statistically significant.

3. Results and Discussion

Table 1 summarizes the characteristics of study participants by gender. A total of 4,195 participants were

included in this study. The mean age of participants was 63.23 years (SD: 7.43 years). There were more female than male participants (80.38% *vs*.19.62%). Among participants, the three leading groups of patients were those with breast cancer (39.02%), colorectal cancer (12.82%), or tracheal and bronchial lung cancer (10.23%). Fewer patients had metastatic cancer than primary cancer (82.26% *vs*.5.50%). Detailed participant disease information is shown in Table S1 (*http://www.biosciencetrends.com/action/getSupplementalData.php?ID=101*).

The high number of female participants in this study may have led to bias, but the types of cancer in the study participants include 25 types commonly classified by site, and the needs they reflect are representative, so the rigor of the results may not have been seriously affected.

Figure 1 shows information on the physical health status of the study participants, which mainly includes disease stage, treatment regimen, and the number of doses of the COVID-19 vaccine. Patients in the early stages of disease (stage I and stage II) accounted for more than half of the total participants. More than a quarter of the patients used Chinese medicine in their recovery, and 17% did not require treatment now. Worryingly, 54% of survey participants were never vaccinated with the COVID-19 vaccine, and only 25% of survey participants completed the full three-dose vaccination.

In Shanghai, the overall vaccination rate for the entire population is over 90%, but the rate for the elderly is 62% and only 38% have received a booster

Table 1. Demographic and sociological information on study participants

Characteristic	Males	Females	All participants
No. of participants	823	3,372	4,195
Age (years)			
18-44	11 (1.3)	54 (1.6)	65 (1.5)
45-59	108 (13.1)	993 (29.4)	1,101 (26.2)
60-74	625 (75.9)	2,201 (65.3)	2,826 (67.4)
> 75	79 (9.6)	124 (3.7)	203 (4.8)
Marital status			
Married	750 (91.1)	2,886 (85.6)	3,636 (86.7)
Single/widowed	73 (8.9)	486 (14.4)	559 (13.3)
Level of education			
< 9 years	341 (41.4)	1,592 (47.2)	1,933 (46.1)
9-12 years	302 (36.7)	1,343 (39.8)	1,645 (39.2)
> 12 years	180 (21.9)	437 (13.0)	617 (14.7)
Employment status			
Employed	39 (4.7)	123 (3.6)	162 (3.9)
Retired	727 (88.3)	2,926 (86.8)	3,653 (87.1)
Unemployed	57 (6.9)	323 (9.6)	380 (9.1)
Physical activity			
Extremely active	254 (30.9)	581 (17.2)	835 (19.9)
Highly active	147 (17.9)	597 (17.7)	744 (17.7)
Moderately active	336 (40.8)	1,415 (42)	1,751 (41.7)
Sedentary	86 (10.4)	779 (23.1)	865 (20.6)
Average monthly income (RMB)			
< 3,000	187 (22.7)	790 (23.4)	977 (23.3)
3,001-6,000	450 (54.7)	1,926 (57.1)	2,376 (56.6)
6,001- 9,000	129 (15.7)	448 (13.3)	577 (13.8)
> 9,000	57 (6.9)	208 (6.2)	265 (6.3)
Medical insurance			
Basic medical insurance	272 (33.0)	1,195 (35.4)	1,467 (35.0)
Employee medical insurance	526 (63.9)	2,010 (59.6)	2,536 (60.5)
Commercial medical insurance	20 (2.4)	161 (4.8)	181 (4.3)
None	5 (0.6)	6 (0.2)	11 (0.3)
Tumor status			
Primary tumor	689 (83.7)	2,762 (81.9)	3,451 (82.3)
Metastatic tumor	53 (6.4)	178 (5.3)	231 (5.5)
Not sure	81 (9.8)	432 (12.8)	513 (12.2)

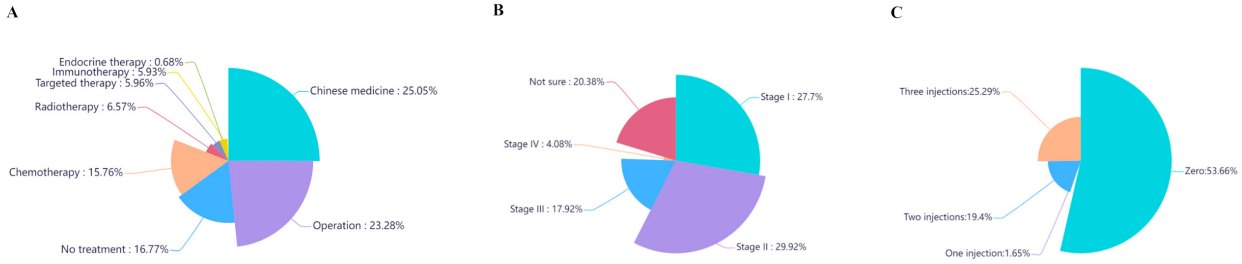

Figure 1. The current status of (A) participant's treatment, (B) disease stage, and (C) COVID-19 vaccination.

Table 2. The different dimensions of study participants' need scores and the top two needs for each dimension score

No.	Dimension	Entry	Mean	SD
1	Social support		0.58	0.47
		Financial support	0.57	0.45
		Volunteer services	0.49	0,37
2	Dietary/nutritional support		0.48	0.36
		Purchase of nutritious meals	0.52	0.38
		Need nutritional guidance	0.48	0.29
3	Psychological counseling		0.39	0.31
		Anxiety and depression	0.42	0.32
		Panic	0.40	0.36
4	Outpatient and emergency medical care		0.33	0.20
		Make appointments with doctors	0.43	0.22
		Ambulance	0.32	0.30
5	COVID-19 infection concerns		0.32	0.49
		Risk of infection	0.41	0.34
		Temporary hospital closure	0.30	0.27
6	Drug supply		0.18	0.43
		Logistical interruptions	0.22	0.41
		Purchasing restrictions	0.13	0.43
7	Approved to visit a medical facility for treatment		0.18	0.44
		Complicated pass procedures	0.20	0.33
		Public transportation/travel suspended	0.17	0.36
8	Online medical treatment		0.15	0.14
		Risk of misdiagnosis, missed diagnosis	0.17	0.16
		Inability to operate	0.10	0.41
9	Nursing care		0.14	0.10
		Purchase of medical devices (e.g., PICC tubes)	0.15	0.18
		Interrupted continuity of care	0.13	0.22

(*11*). Cancer patients have lower vaccination rates compared to the general population, but vaccine hesitancy in this susceptible population is influenced by multiple factors. Di Noia *et al*. (*15*) found that the most common reasons for vaccine refusal were fear of adverse events related to the vaccine (48%), negative interactions with concomitant antineoplastic therapy (27%), and fear of allergic reactions (11%). These concerns, along with the lack of guidance from oncologists and information about the safety and efficacy of COVID-19 vaccines and the inability of primary care physicians to meet patients' counseling needs, are the most common factors associated with cancer patients' vaccine hesitancy (*16-18*).

As shown in Table 2, the greatest need for supportive patient care in each dimension was the social support dimension (mean (SD): 0.58 (0.47)), followed by dietary/nutritional support (mean (SD):0.48 (0.36)) and psychological counseling (mean (SD): 0.39 (0.31)). Outpatient emergencies (mean (SD): 0.33 (0.20)) were the most prevalent of the three dimensions of medical care, and participants had a significantly greater need for doctor appointments (mean (SD): 0.43 (0.22)). Table S2 (*http://www.biosciencetrends.com/action/getSupplementalData.php?ID=101*) shows the correlation between participants' need scores in each dimension.

Social support is a multidimensional concept that may be defined as "the aid – the supply of tangible or intangible resources – individuals gain from their network members" (*19*). The current results indicated that social support was a top need of cancer patients during the Shanghai lockdown. Numerous studies corroborate this finding. A longitudinal study conducted in Germany reported that social support factors were strongly associated with all quality of life indicators. Compared to 0-3 social contacts per week, ten or more social contacts were associated with a 70% reduction in the risk of more depressive symptoms, a 39% reduction in the risk of more anxiety symptoms, while increasing the chance of increased well-being by 73% (*20*). In Australia, a national coalition – Ending Loneliness Together – has been established to bring together researchers and care providers, and this interdisciplinary collaboration between social science and clinical medicine is important for public issues such as the lack of social support that existed prior to the COVID-19 pandemic and now (*21*).

The current results indicated that participants had less of a need for online medical care (mean (SD): 0.15 (0.14)). One possible reason was that online hospitals could not meet the needs of cancer patients (Table 2). In 2018, China began to develop an "online medical/healthcare" system, providing online services such as medical appointments, follow-up of chronic conditions, and telemedicine. The global COVID-19 pandemic has occasioned a transition from "face-to-face" to "online and offline" healthcare. As of June 2021, China has more than 1,600 online hospitals, and healthcare locations are expanding from hospitals to cover prevention, treatment, and rehabilitation (*22*). However, the development of online medicine faces issues such as the scope of physician practice, the use of telemedicine tools, and reimbursement of expenses (*23*). The current COVID-19 pandemic is again providing a reminder of the importance of using telehealth to deliver care, and especially as a means of reducing the risk of cross-contamination caused by close contacts (*24*). Findings from a cohort study

Table 3. Results of univariate regression analysis of study participants' need scores

Groups	Need score								
	Outpatient and emergency medical care	Drug supply	Nursing care	Online medical treatment	COVID-19 infection concerns	Dietary/nutritional support	Approved to visit a medical facility for treatment	Psychological counseling	Social support
Gender									
Males	0.35	0.18	0.14	0.17	0.25	0.48	0.25	0.30	0.49
Females	0.32	0.18	0.14	0.15	0.34*	0.46	0.16*	0.41*	0.46*
Age (years)									
18-44	0.48	0.28	0.18	0.20	0.34	0.61	0.25	0.48	0.51
45-59	0.33	0.17	0.15	0.13	0.34	0.45	0.14	0.40	0.49
60-74	0.33	0.18	0.13	0.16	0.32	0.47	0.19	0.39	0.45
> 75	0.29	0.16	0.18	0.21*	0.22*	0.40*	0.16*	0.31	0.44
Marital status									
Married	0.32	0.18	0.13	0.15	0.31	0.46	0.18	0.38	0.45
Unmarried/widowed	0.37*	0.19	0.18*	0.16	0.36*	0.50	0.18	0.46*	0.53*
Education level									
< 9 years	0.28	0.17	0.14	0.14	0.33	0.47	0.17	0.35	0.45
9-12 years	0.34	0.19	0.13	0.15	0.31	0.45	0.16	0.41	0.48
> 12 years	0.45*	0.20	0.16	0.20*	0.31	0.49	0.24*	0.45*	0.49
Working status									
Employed	0.39	0.19	0.15	0.22	0.28	0.47	0.21	0.43	0.44
Retired	0.33	0.18	0.13	0.15	0.32	0.46	0.18	0.39	0.46
Unemployed	0.29	0.13	0.17	0.10*	0.34	0.53	0.16	0.37	0.54*
Physical activity									
Sedentary	0.37*	0.23*	0.17*	0.18*	0.33	0.48	0.21	0.44*	0.49
Extremely active	0.28	0.14	0.14	0.14	0.34	0.48	0.18	0.36	0.46
Highly active	0.28	0.18	0.13	0.13	0.31	0.46	0.16	0.37	0.43
Moderately active	0.36	0.17	0.13	0.15	0.31	0.46	0.17	0.39	0.47
Average monthly income (RMB)									
< 3,000	0.29	0.17	0.15	0.15	0.34	0.53	0.17	0.36	0.51
3,001-6,000	0.35	0.19	0.14	0.15	0.32	0.46	0.19	0.39	0.47
6,001-9,000	0.31	0.16	0.12	0.16	0.31	0.42	0.15	0.41	0.36
> 9,000	0.35	0.17	0.13	0.14	0.28	0.37*	0.20	0.41	0.41*

*p-value < 0.05

Table 4. Results of generalized linear regression models for multifactor analysis of study participants' need scores

Groups	OR (95% CI)								
	Outpatient and emergency medical care	Drug supply	Nursing care	Online medical treatment	COVID-19 infection concerns	Dietary/ nutritional support	Approved to visit a medical facility for treatment	Psychological counseling	Social support
Age									
18-44	Reference								
45-59	0.92 (0.79-1.08)	0.90 (0.80-1.00)	0.99 (0.90-1.09)	0.97 (0.88-1.08)	0.99 (0.87-1.13)	0.90 (0.79-1.02)	0.94 (0.84-1.05)	0.96 (0.83-1.12)	0.87 (0.77-0.98)*
60-74	0.90 (0.77- 1.06)	0.90 (0.81-1.02)	0.98 (0.90-1.08)	1.01 (0.91-1.13)	0.98 (0.86-1.12)	0.93 (0.82-1.06)	0.99 (0.88-1.11)	0.97 (0.84-1.13)	0.84 (0.74-0.95)*
> 75	0.84 (0.70-1.00)*	0.88 (0.78- 1.00)	1.03 (0.92-1.15)	1.05 (0.93-1.19)	0.90 (0.78-1.04)	0.85 (0.74-0.99)*	0.93 (0.82-1.06)	0.90 (0.76-1.06)	0.83 (0.72-0.95)*
Gender									
Males	Reference								
Females	0.97 (0.92-1.02)	0.99 (0.95-1.02)	0.99 (0.96-1.02)	0.99 (0.96-1.02)	1.08 (1.04-1.13)*	0.99 (0.95-1.03)	0.91 (0.89-0.95)*	1.12 (1.07-1.17)	0.96 (0.92-1.00)*
Marital status									
Married	Reference								
Single/widowed	1.02 (0.97-1.08)	1.00 (0.96-1.04)	1.03 (1.00-1.07)	1.00 (0.96-1.03)	1.03 (0.98-1.07)	1.04 (1.00-1.08)	0.99 (0.95-1.03)	1.03 (0.98-1.08)	1.01 (0.97-1.05)
Education level									
< 9 years	Reference								
9-12 years	1.04 (0.99-1.08)	1.00 (0.97-1.03)	0.99 (0.96-1.01)	0.99 (0.96-1.01)	0.98 (0.95-1.02)	0.99 (0.96-1.03)	0.98 (0.95-1.01)	1.01 (0.97-1.05)	1.01 (0.98-1.04)
> 12 years	1.15 (1.08-1.22)*	1.01 (0.97-1.06)	1.01 (0.97-1.05)	1.03 (0.99-1.07)	1.02 (0.97-1.07)	1.06 (1.01-1.12)*	1.06 (1.01-1.11)*	1.08 (1.03-1.15)*	1.03 (0.98-1.08)
Working status									
Employed	Reference								
Retired	1.00 (0.90-1.11)	1.02 (0.94-1.09)	0.99 (0.93-1.06)	0.92 (0.86-0.99)*	1.04 (0.95-1.13)	1.01 (0.92-1.09)	0.97 (0.90-1.05)	0.97 (0.89-1.07)	1.05 (0.97-1.13)
Unemployed	0.97 (0.87-1.09)	0.95 (0.88-1.04)	1.03 (0.96-1.11)	0.88 (0.82-0.95)*	1.04 (0.94-1.14)	1.04 (0.95-1.14)	0.96 (0.89-1.05)	0.96 (0.86-1.06)	1.04 (0.95-1.14)
Physical activity									
Sedentary	Reference								
Extremely active	0.95 (0.90-1.01)	0.91 (0.88-0.96)*	0.96 (0.92-1.00)*	0.95 (0.91-1.00)*	1.02 (0.97-1.07)	0.98 (0.93-1.03)	0.95 (0.91-1.00)*	0.98 (0.92-1.04)	1.06 (1.01-1.12)*
Highly active	0.94 (0.89-1.00)	0.95 (0.91-0.99)*	0.95 (0.92-0.99)*	0.95 (0.91-0.99)*	0.99 (0.94-1.04)	0.97 (0.93-1.02)	0.95 (0.91-1.00)*	0.97 (0.92-1.03)	1.05 (1.00-1.11)*
Moderately active	0.99 (0.94-1.04)	0.94 (0.90-0.97)*	0.95 (0.92-0.98)*	0.97 (0.93-1.00)*	0.99 (0.95-1.03)	0.97 (0.94-1.01)	0.95 (0.92-0.99)*	0.98 (0.93-1.02)	1.04 (1.00-1.07)*
Average monthly income (RMB)									
< 3,000	Reference								
3,001-6,000	1.03 (0.98-1.07)	0.99 (0.95-1.02)	1.00 (0.97-1.03)	0.97 (0.94-1.01)	0.99 (0.95-1.03)	0.93 (0.90-0.97)*	1.00 (0.97,1.04)	1.00 (0.95-1.04)	1.04 (1.01-1.08)*
6,001-9,000	0.95 (0.89-1.02)	0.95 (0.90-1.00)*	0.97 (0.93-1.01)	0.97 (0.93-1.02)	0.98 (0.93-1.04)	0.88 (0.84-0.93)*	0.94 (0.90,0.99)*	1.02 (0.96-1.08)	1.06 (1.00-1.12)*
> 9,000	0.99 (0.91-1.08)	0.96 (0.90-1.03)	0.98 (0.93-1.04)	0.95 (0.90-1.01)	0.95 (0.89-1.02)	0.84 (0.79-0.90)*	0.99 (0.93,1.06)	1.02 (0.94-1.11)	1.04 (0.97-1.11)
Disease staging									
Stage I	Reference								
Stage II	1.01 (0.96-1.05)	1.01 (0.97-1.04)	1.01 (0.98-1.03)	1.00 (0.97-1.03)	1.03 (0.99-1.07)	1.00 (0.97-1.04)	1.01 (0.97-1.04)	1.01 (0.96-1.05)	1.00 (0.97-1.04)
Stage III	1.07 (1.01-1.13)*	1.06 (1.02-1.09)*	1.02 (0.99-1.06)	1.02 (0.99-1.06)	1.03 (0.99-1.08)	1.07 (1.02-1.12)*	1.05 (1.01-1.09)*	1.08 (1.02-1.14)*	1.02 (0.97-1.06)
Stage IV	1.13 (1.02-1.23)*	1.15 (1.07-1.23)*	1.21 (1.14-1.28)*	1.07 (1.01-1.14)*	0.98 (0.90-1.06)	1.07 (1.00-1.16)	1.03 (0.96-1.11)	1.09 (1.00-1.20)	0.91 (0.85-0.99)*
Not sure	1.01 (0.96-1.06)	1.03 (0.99-1.07)	1.05 (1.02-1.08)*	1.02 (0.98-1.05)	1.00 (0.96-1.05)	1.04 (0.99-1.08)	1.02 (0.99-1.06)	1.00 (0.95-1.05)	0.97 (0.93-1.01)
COVID-19 Vaccine									
Zero	Reference								
One injection	0.88 (0.76-1.02)	1.04 (0.93-1.15)	0.94 (0.86-1.03)	0.95 (0.86-1.04)	0.94 (0.84-1.05)	1.01 (0.90-1.14)	1.03 (0.92-1.14)	0.64 (0.56-0.73)*	1.00(0.90-1.12)
Two injections	0.92 (0.88-0.97)*	0.93 (0.90-0.96)*	0.97 (0.94-1.00)*	0.97 (0.93-1.00)*	0.93 (0.90-0.97)*	1.09 (1.05-1.14)*	1.00 (0.96-1.03)	0.62 (0.59-0.64)*	1.04 (1.00-1.07)*
Three injections	0.90 (0.85-0.93)*	0.90 (0.88-0.93)*	0.95 (0.92-0.98)*	0.93 (0.90-0.96)*	0.89 (0.85-0.91)*	1.08 (1.04-1.12)*	0.96 (0.93-1.00)*	0.63 (0.60-0.66)*	1.06 (1.03-1.11)*

*p-value < 0.05

support the value proposition of virtual care (the delivery of telehealth *via* information and communication technology), as it minimized disruptions to patient care during the COVID-19 pandemic (*25*). A scoping review, which identified and included 66 studies, reported that digital solutions can be integrated into routine supportive care in oncology practice to provide improved patient-centered care (*26*). Telehealth visits are appropriate if the primary reason for a cancer patient's visit is to follow up on adherence to oral medications, survival, genetic counseling, support services, or education (*27*). With the help of the 5G network and artificial intelligence, the adoption of telemedicine needs to be expanded and the accessibility of online healthcare in China needs to be improved.

Tables 3 and 4 respectively show the results of univariate and multivariate regression analysis. Disease stage is a factor influencing cancer patients' need scores, for example, participants in stage III of disease were 1.07 times more likely to have an increased need for outpatient medical care than patients in the early stages of disease (stage I). In addition, an increase in the number of patients receiving a COVID-19 vaccine was associated with less need for medical care. Participants who had received one, two, or three doses of a COVID-19 vaccine were 36% (OR: 0.64, 95% CI: 0.56-0.73), 38% (OR: 0.62, 95% CI: 0.59-0.54), and 37% (OR: 0.63, 95% CI: 0.60-0.66) less likely to have an increased need for psychological counseling, respectively, compared to participants who had never received a COVID-19 vaccine.

A study of 1,129 breast cancer patients at a cancer center in Taiwan yielded results similar to the current findings, and the study reported that patients with stage II, III, or IV breast cancer had significantly fewer nutritional needs than patients with stage I cancer (*28*). A study in Italy confirmed the dynamic nature of cancer patients' needs, emphasizing that individual unmet needs differ significantly in different stages (*29*). However, previous studies have paid less attention to comparing changes in the needs of cancer patients due to epidemic lockdowns, and there is still insufficient evidence from real-time population studies.

The current findings provide evidence that vaccination with a COVID-19 vaccine reduced the psychological needs of cancer patients during the Shanghai lockdown, but the relevant evidence is still mixed. Like the current study, a Polish study of 1,696 participants reported that COVID-19 vaccination reduced the level of anxiety about being infected and anxiety due to COVID-19 (*30*). Another study in the United States found that vaccinated participants were 15% less likely to be anxious (adjusted odds ratio [AOR]: 0.85, 95% CI: 0.83-0.90) and 17% less likely to be depressed (AOR: 0.83, 95% CI: 0.79-0.85) compared to those who were not vaccinated (31). In contrast, Voss *et al*. noted that state anxiety levels did not differ significantly before, during, and after vaccination. Although anxiety levels tended to decrease after vaccine approval, the decrease was not significant (*32*). Vaccination against COVID-19 is a key step in establishing a universal immune barrier (*33,34*), and its unique role in the psychological domain also warrants examination in depth.

In conclusion, the needs of a large number of cancer patients cannot be ignored while fighting the COVID-19 epidemic. Telemedicine should allow the practice of patient-centered care and provide greater convenience and accessibility. More findings based on quality evidence can facilitate vaccine development and clinical trials while drafting more detailed guidelines for vaccinating cancer patients to build an immune barrier.

Acknowledgements

The authors gratefully acknowledge the support of the Shanghai Cancer Rehabilitation Club.

Funding: This study was supported by a grant from the China Medical Board, "The study of a home-based supportive care system for cancer patients receiving oral chemotherapy" (No. 20-387).

Conflict of Interest: The authors have no conflicts of interest to disclose.

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Reeceived May 23, 2022; Revised June 4, 2022 ; Accepted June 11, 2022.

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Released online in J-STAGE as advance publication June 17, 2022.