## RESEARCH





# Factors influencing the spiritual needs of patients with terminal cancer: a multicenter study in southern China

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## Abstract

**Background** There is limited evidence regarding the influencing factors associated with diverse types of spiritual needs in patients with terminal cancer. To investigate the spectrum of spiritual needs in patients with terminal cancer and clarify the impact of cancer -related pain, fatigue, sociodemographic characteristics on these needs.

**Methods** This cross-sectional study was designed in accordance with the STROBE guidelines. Participants (*N*=224) were recruited from three tertiary class A medical centers in southern China via convenience sampling. Socio-demographic, clinical profiles, spiritual needs, pain and fatigue were assessed. Univariate and multivariate analyses were performed using standardized statistical methods.

**Results** Multiple linear regression analysis revealed that religious affiliation, residence, healthcare payment method, pain properties and number of pain sites significantly predicted the overall spiritual needs of patients with terminal cancer (F = 6.972, p < 0.001; Durbin-Watson statistic = 1.642; adjusted  $R^2 = 0.337$ ). Subgroup analyses demonstrated distinct predictors for specific spiritual domains: pain severity predicted needs for love and connection and hope and peace, while pain properties and multifocal pain influenced meaning and purpose and overall spiritual needs (p < 0.001; adjusted  $R^2$  range: 0.273–0.386).

**Conclusion** Religious affiliation and healthcare payment method emerged as prominent predictors of diverse spiritual needs in the analysis. Pain severity and multifocal pain differentially influenced specific spiritual domains. Although this study attempts to identifies patterns in spiritual needs, individual variability persists. These findings underscore the necessity of personalized spiritual care in hospice settings, tailored to the content and intensity of each patient's unique needs.

Keywords Neoplasms, Terminal care, Spirituality, Pain

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## Introduction

Cancer remains a leading global cause of mortality, accounting for approximately 10 million deaths (onesixth of total deaths) in 2020 [31]. As the world's most populous nation, China bears a disproportionately high cancer burden. According to the 2022 global cancer statistics released by the National Cancer Center (NCC) of China, 2.57 million cancer-related deaths were recorded in China, the highest global incidence [9]. Beyond its profound impact on public health, cancer imposes significant economic and societal burdens [26].

Patients with terminal cancer typically have a life expectancy of less than six months and frequently experience multiple comorbidities and systemic symptoms [13]. Pain is among the most prevalent and challenging symptoms in this population, with an incidence rate of 66.4% [37]. Beyond its physical manifestations, pain profoundly disrupts daily activities, social interactions, sleep quality, and cognitive function[11]. Consequently, the primary focus of care for patients with terminal cancer shifts from life extension to symptom management, pain alleviation, and quality-of-life enhancement[5].

Recent advancements in holistic healthcare have emphasized the integration of spiritual needs into patient care frameworks[2]. Hospice care is an effective form to achieve this goal, delivering comprehensive support encompassing physical, psychological, social and spiritual domains for patients with terminal cancer [28]. A systematic review by Hindmarch, et al. [10] highlighted the potential role of spiritual interventions in mitigating cancer-related pain. In a randomized controlled trial involving 145 cancer patients, Amini et al. [1] demonstrated that a three-day spiritual care intervention significantly reduced fatigue and pain scores compared to the control group.

The National Consensus Project for Quality Palliative Care (NCP) defines spirituality as a process through which individuals seek and articulate meaning and purpose of life, while fostering connections with the present moment, others, the self, transcendent beings (e.g., deities), nature and faith systems [30]. Within Eastern cultural traditions, concepts such as "Tao", "virtue", "benevolence", "righteousness", "manners", "wisdom" and "credit" are also the embodiment of spiritual connotation[36].

Spiritual needs constitute a critical component of holistic care and an inherent human requirement, distinct from religious affiliation, and has received increasing attention in recent years. Systematic reviews [18, 37] consistently demonstrate that individuals with life-limiting illnesses exhibit pronounced spiritual needs. Life-threatening illnesses compel individuals to confront existential realities frequently overshadowed by the demands of daily life, such as terminal cancer, heightens patients' introspective engagement with spirituality, fostering a deepened exploration of meaning and transcendence [15]. As patients confront progressive health decline, they frequently grapple with existential inquiries regarding life's meaning, purpose, and mortality. Mesquita et al. (Mesquita et al., 2017) synthesized findings from 10 guantitative and 6 gualitative studies (N=1,469) to delineate the spiritual needs of palliative cancer patients. Thematic analysis identified seven domains: (1) living with illness and finding meaning; (2) having connections with others, divinity, and nature; (3) engaging in religious or spiritual beliefs and practice; (4) knowing the spiritual needs related to the overall (bio-psychologicalsocial spiritual existence); (5) openly discussing death; (6) dealing with "unfinished things" and using the remaining time; and (7) wanting to be respected and maintain dignity. While the prevalence and typology of spiritual needs among patients with terminal cancer are welldocumented, empirical evidence linking these needs to personal factors (such as fatigue, pain, sociodemographic variables, etc.) remains sparse. Elucidating these associations is critical for developing targeted clinical interventions.

Previously, scholars had explored this issue. Xin Shi et al. [24] identified religious affiliation, marital status, and fatigue as significant predictors of spiritual needs in patients with terminal cancer. Riklikienė et al. [21] reported that female patients exhibit heightened spiritual needs compared to males, and pain emerging as a key contributing factor. However, conflicting evidence exists regarding the association between cancer-related pain and spiritual needs. Hindmarch et al. [10] found no direct correlation between pain severity and spiritual needs. Furthermore, Mamier, et al. [15] conducted a cross-cultural analysis comparing Korean and American patients with chronic illnesses, revealing that religious affiliation significantly shape both the intensity and nature of spiritual needs. For individuals adhering to specific religious traditions, spiritual needs often intertwine with religious practices. However, China's sociocultural characterized by religious pluralism and a substantial nonreligious population [29]. In such a diverse social culture, the spiritual needs of patients with cancer may be very different from those of patients with specific religious backgrounds. Although the factors influencing spiritual needs have been examined in many parts of the world, the results vary. As far as know, limited research has systematically investigated of the factors influencing specific subtypes of spiritual needs. Do cultural differences alter the expression of spiritual needs in terminal cancer?

In conclusion, this study aims to characterize the spectrum of spiritual needs among patients with terminal cancer and elucidate the influence of cancer-related pain, fatigue, sociodemographic variables on these needs. By identifying key predictors, this research seeks to inform the optimization of spiritual care program, thereby enhancing spiritual well-being, alleviating patient suffering, mitigating caregiver burden, and facilitating dignified end-of-life experiences. The specific objectives are to: (1) Assess the prevalence and typology of spiritual needs in patients with terminal cancer within southern China. (2) Determine sociodemographic factors associated with variations in spiritual needs. (3) Evaluate the predictive capacity of pain and fatigue to distinct spiritual domains. (4) Improve nursing intervention based on categorized spiritual needs.

## Method

## Design

This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [32]. A cross-sectional observational design was employed across three tertiary class A research centers in southern China, with detailed methodological framework illustrated in Fig. 1.

### Participants and setting

Participants were recruited via convenience sampling from March 2021 to January 2023, Eligibility screening was performed for patients with terminal cancer during follow-up visits in three tertiary class A hospitals in southern China.

#### Inclusion criteria

- (1) Histologically or pathologically confirmed terminal cancer or metastatic cancer.
- Age ≥ 18 years, with full awareness of diagnosis and prognosis.
- (3) Expected survival <6 months (Chinese Prognostic Scale score > 6).
- (4) Adequate literacy and comprehension skills, without hearing impairments, capable of articulating personal needs.
- (5) Voluntary participation with signed informed consent.

## Exclusion criteria

 Existing psychiatric conditions or language communication barriers.

### Sample size calculation

The sample size calculation was based on a two-tailed test with  $\alpha$  of 0.05, an expected standard deviation of 19.30, and a margin of error of 2.9 [38]. The minimum



Fig. 1 Technology Roadmap

sample size was 173 participants, and considering a 20% attrition rate, the final target sample size was 217.

#### Procedure

Eight oncology nurses from three tertiary class A hospitals in southern China were responsible for site-specific data collection. All nurses held at least a bachelor's degree and had  $\geq$  3 years of clinical oncology experience. Prior to data collection, standardized training was delivered via virtual sessions to ensure protocol adherence, including eligibility criteria, data collection procedures, questionnaire administration, and informed consent processes. Training duration exceeded 48 h.

Trained nurses conducted patient screening, obtained written consent, and provided detailed instructions to participants. For patients unable to complete questionnaires independently, researchers provided assistance while strictly adhering to participants' expressed preferences. Completed questionnaires were verified for completeness immediately after collection.

#### Measures

## Sociodemographic and clinical characteristics

A researcher-developed questionnaire captured sociodemographic variables (e.g., gender, education, income) and clinical data (e.g., ECOG Performance Status, disease diagnosis, treatment regimen).

#### Spiritual Needs Scale (SNS)

The Spiritual Needs Scale (SNS) adapted and validated for Chinese populations by Cheng Qinqin et al. [20], was utilized. This 23-item instrument assesses five domains: love and connection, hope and peace, meaning and purpose, relationship with the transcendent, and acceptance of deah. Responses were recorded on a 5-point Likert scale, with a total score of 115, with higher the scores indicating greater spiritual needs. The Chinese SNS demonstrated robust psychometric properties (Cronbach's  $\alpha$  = 0.908, split-half reliability = 0.926, test–retest reliability = 0.902) and has been extensively applied in studies of chronic disease populations.

#### Brief Pain Inventory(BPI)

The Brief Pain Inventory (BPI), originally developed by Daut et al. [7], is a multidimensional tool for assessing chronic pain. Wang, et al. [33] validated the Chinese version, reporting strong reliability (Cronbach's  $\alpha$ =0.81, test–retest reliability=0.79). Pain intensity was scored across four domains (worst, least, average, current pain), with total scores ranging from 0 (no pain) to 10 (most severe). Scores were categorized as mild (<4), moderate (4–6), or severe (>6).

#### Brief fatigue Inventory (BFI)

The Brief fatigue Inventory (BFI) comprises nine items evaluating fatigue severity, three of which score the fatigue in the past 24 h (worst, average, current), and another six items describing its impact on daily life in the past 24 h (e.g., general activity, mood, mobility). Each item is scored 0–10, with total scores averaged to classify fatigue as none (0), mild (1–3), moderate (4–6), severe (7–9), or extreme (10).

#### Chinese Prognostic Scale (ChPS)

The Chinese Prognostic Scale (ChPS) was developed by Zhou Lingjun et al. [4, 14], predicts survival in patients with terminal cancer. The model predicted 3-month survival with 69% accuracy[40]. The scale incorporates 14 prognostic factors (e.g., KPS score, pain, ascites) and stratifies survival as follows:  $\leq 6$  points (180–365 days), 7–8 points (90–180 days), 9–10 points (30–90 days), 11–12 points (7–30 days), and > 12 points (<7 days).

The assessments of spiritual needs, pain and fatigue in this study were performed by hospice care nurses. The expected survival was achieved by hospice care nurses in each research center under the guidance of an oncology palliative care specialist.

## **Data statistics**

Data were analyzed using IBM SPSS 26.0. Continuous variables were summarized as mean  $\pm$  SD or median (IQR); categorical variables were described by frequencies(%).The missing data were filled in by mean. Non-normally distributed data were analyzed via Kruskal–Wallis tests (univariate) and Spearman's correlation (spiritual needs vs. fatigue). Multivariate predictors of spiritual needs were identified through linear regression ( $\alpha$ =0.05).

#### Ethics

This study received ethical approval (K2021-031-01) and strictly complied with the ethical behavior standards for social behavior research.

### Results

Data were collected from three tertiary class A hospitals in southern China, Among 250 patients with terminal cancer undergoing long-term follow-up, 231 met eligibility criteria and received questionnaires. A total of 224 valid responses were obtained, yielding an effective response rate of 97.0%. Data collection process is detailed in Fig. 2.

#### Sociodemographic data and clinical characteristics

The	final	sample	comprised	224	patients
(male	:female		ratio = 1.6:1;		mean



Fig. 2 Diagram of data collect

age =  $55.74 \pm 14.1$  years). Sociodemographic characteristics are summarized in Table 1. Among the participants, 158 (82.59%) patients underwent chemotherapy and/or radiotherapy the clinical profiles are provided in Supplementary Form 1.

#### **Pain characteristics**

Patients with terminal cancer predominantly reported mild to moderate pain, and they all receiving standardized pain treatment. Pain was absent in 2 participants (0.89%), and 214 (95.54%) reported single-site pain. Distending pain was the most prevalent subtype (n=78, 34.82%). The pain characteristics of the patients with terminal cancer are provided in Supplementary Form 2.

#### Current status of the spiritual needs

The total spiritual needs score was  $70.88 \pm 19.38$ . Among the five domains, hope and peace exhibited the highest mean score  $(3.61 \pm 1.00)$ , whereas relationship with the transcendent scored lowest  $(2.40 \pm 1.26)$ . The top three items ranked as important by participants were: "Have hope for life"  $(3.74 \pm 1.17)$ , "In the midst of pain, still with hope"  $(3.66 \pm 1.18)$ , and "Having someone warm or caring for me"  $(3.65 \pm 1.20)$ , with 52.14%, 54.92%, and 54.46% of participants rating them  $\geq 4$  points, respectively. Participants identified the least important spiritual needs as "The meaning of life lasts forever after death"  $(2.23 \pm 1.35)$ , "Blessed by God to help fight disease"  $(2.28 \pm 1.43)$ , "Pray to God, participate in religious services"  $(2.32 \pm 1.41)$ , These three items had the lowest average score, with 66.07%, 61.16%, and 62.50% of participants rating them  $\leq 2$  points, respectively. The mean scores and distribution of spiritual needs among patients with terminal cancer are presented in Table 2.

### Univariate analysis

- (1) Religious affiliation (p < 0.001), healthcare payment method (p < 0.001), residence (p < 0.05), alcohol use (p < 0.05), pain properties (p < 0.05), number of pain sites (p < 0.01) were identified as significant factors affecting the overall spiritual needs of patients with terminal cancer, as detailed in Table 3, 4 and 5.
- (2) Religious affiliation (p < 0.001), healthcare payment method (p < 0.001), residence (p < 0.01), smoking or alcohol use (p < 0.05), ECOG score (p < 0.05), and pain properties (p < 0.01) were found to impact the spiritual needs related to love and connection in patients with terminal cancer.
- (3) Age (p < 0.05), educational attainment (p < 0.01), religious affiliation (p < 0.001), healthcare payment method (p < 0.001), smoking (p < 0.01), body mass index (BMI) (p < 0.05), and pain properties (p < 0.01) were identified as factors influencing the hope and peace domain of spiritual needs in patients with terminal cancer.
- (4) Significant factors influencing the meaning and purpose domain of spiritual needs in patients with terminal cancer included educational attainment (p < 0.05), religious affiliation (p < 0.001), healthcare

Table 1	Sociodemograp	hic data o	f patients with	n terminal
cancer				

Items	Frequency	Composition ratio (%)
Age		
≤40 years old	43	19.20%
41–60 Years old	87	38.84%
>60 Years old	94	41.96%
Gender		
Male	138	61.61%
Female	86	38.39%
Marital status		
Married	213	95.09%
Widowed / divorced	7	3.13%
Unmarried	4	1.79%
Degree of education		
Primary school and below	88	39.29%
Junior middle school	70	31.25%
High school or technical secondary school	40	17.86%
Junior college	16	7.14%
Bachelor degree or above	10	4.46%
Religious affiliation		
Buddhism	98	43.75%
Christianity	8	3.57%
Other religious affiliations	8	3.57%
No religious affiliation	110	49.11%
Per capita monthly household income		
≤ 3000 yuan	129	57.59%
3001–5000 yuan	84	37.50%
>5000 yuan	11	4.91%
Occupation		
Unemployed	151	67.41%
Manual workers	42	18.75%
TeAching painr or clerk	14	6.25%
Businessman	9	4.02%
Other job	8	3.57%
Healthcare payment method		
New rural cooperative	106	47.32%
Urban medical insurance	20	8.93%
Municipal medical insurance	36	16.07%
Provincial medical insurance	53	23.66%
At one's own expense	9	4.02%
Place of Residence		
City	59	26.34%
Towns	79	35.27%
Village	86	38.39%
Whether to smoke		
Yes	4	1.79%
Deny	154	68.75%
Ever suck	66	29.46

Items	Frequency	Composition ratio (%)
Whether to drink		
Deny	188	83.90%
Ever drink	36	16.10%

payment method (p < 0.001), residence (p < 0.05), smoking or alcohol use (p < 0.05), tumor type (p < 0.05), body mass index (p < 0.05), pain properties (p < 0.05), and number of pain sites (p < 0.05).

- (5) Age (p < 0.05), gender (p < 0.05), religious affiliation (p < 0.001), occupation (p < 0.05), and healthcare payment method (p < 0.001) were identified as independent variables with a significant impact on the relationship with the transcendent domain.
- (6) Religious affiliation (p < 0.01), Tumor type (p < 0.05) and ECOG score (p < 0.05) were found to influence the spiritual needs of patients with terminal cancer regarding acceptance of death. The remaining data did not significantly affect the spiritual needs (p > 0.05).

The results of the univariate analysis of sociodemographic data across each domain are presented in Table 6, for clinical characteristics across each domain in Table 7, and for pain characteristics across each domain in Supplementary Form 3.

#### **Correlation analysis**

Spearman's rank correlation analysis revealed significant associations between spiritual need and pain/ fatigue in patients with terminal cancer, as presented in Table 8. The love and connection domain exhibited positive correlations with the lightest pain intensity, average pain intensity, and overall pain severity (p < 0.01). The hope and peace domain showed a positive association with average pain intensity (P < 0.05) but was inversely related to fatigue severity (p < 0.05). For the meaning and purpose domain, a significant negative correlation with fatigue (p < 0.05) was observed. The relationship with the transcendent domain demonstrated positive associations with the heaviest pain intensity, average pain intensity, current pain intensity, and overall pain severity (p < 0.05). Additionally, the acceptance of death domain was positively correlated with heaviest pain intensity (p < 0.05). Overall spiritual needs were significantly associated with average pain intensity (p < 0.01) and the overall pain severity (p < 0.05).

Table 2 The average score and distribution of spiritual needs of patients with terminal cancer

Item	Not at all	Seldom	Sometimes	Often	A great deal	$Mean\pmSD$
Love and connection						3.38±0.94
1. Communicate with people who want to listen to me	14(6.25%)	40(17.86%)	77(34.38%)	59(26.34%)	34(15.18%)	$3.26 \pm 1.11$
2. Having someone warm or caring for me	10(4.46%)	31(13.84%)	61(27.23%)	47(20.98%)	75(33.48%)	$3.65 \pm 1.20$
3. Forgive others, and also be forgiven	22(9.82%)	55(24.55%)	67(29.91%)	39(17.41%)	42(18.30%)	$3.10 \pm 1.24$
4. Being accepted by others when ill	11(4.91%)	47(20.98%)	50(22.32%)	47(20.98%)	69(30.80%)	$3.52 \pm 1.26$
15. My family prayed for me	15(6.70%)	45(20.09%)	64(28.57%)	42(18.75%)	58(25.89%)	$3.37 \pm 1.25$
Hope and peace						$3.61 \pm 1.00$
5. In the midst of pain, still with hope	6(2.68%)	37(16.52%)	58(25.89%)	49(21.88%)	74(33.04%)	$3.66 \pm 1.18$
6. Have hope for life	6(2.68%)	31(13.84%)	59(26.34%)	47(20.98%)	81(36.16%)	3.74±1.17
7. Get peace of mind by overcoming the pain of treatment	5(2.23%)	42(18.75%)	62(27.68%)	50(22.32%)	65(29.02%)	$3.57 \pm 1.16$
9. Share life with people close to you	3(1.34%)	53(23.66%)	52(23.21%)	66(29.46%)	50(22.32%)	$3.48 \pm 1.12$
Meaning and purpose						$3.17 \pm 0.90$
8. Soothes physical pain by relieving inner pain	11(4.91%)	32(14.29%)	67(29.91%)	65(29.02%)	49(21.88%)	$3.49 \pm 1.13$
10. Use the rest of your life to help people	24(10.71%)	65(29.02%)	44(19.64%)	52(23.21%)	39(17.41%)	$3.08 \pm 1.28$
11. Discover the meaning of life by reviewing the course of life	9.38(21%)	64(28.57%)	45(20.09%)	61(27.23%)	33(14.73%)	$3.09 \pm 1.23$
12 Live meaningful even in a difficult situation	9(4.02%)	48(21.43%)	52(23.21%)	65(29.02%)	50(22.32%)	$3.44 \pm 1.17$
13 Understand why I got this disease	37(16.52%)	63(28.13%)	53(23.66%)	45(20.09%)	26(11.61%)	$2.82 \pm 1.26$
14 Make the rest of your life valuable	17(7.59%)	61(27.23%)	63(28.13%)	49(21.88%)	34(15.18%)	$3.10 \pm 1.18$
Relationship with the transcendent						$2.40 \pm 1.26$
16. Listen to prayer music or positive energy books	67(29.91%)	56(25.00%)	35(15.63%)	30(13.39%)	36(16.07%)	$2.61 \pm 1.44$
17. Pray to God, participate in religious services	90(40.18%)	51(22.77%)	31(13.84%)	25(11.16%)	27(12.05%)	$2.32 \pm 1.41$
18. Blessed by God to help fight disease	99(44.20%)	38(16.96%)	42(18.75%)	15(6.70%)	30(13.39%)	$2.28 \pm 1.43$
Acceptance of death						$2.67 \pm 1.00$
19. Review life and accomplish unfinished things	59(26.34%)	69(30.80%)	42(18.75%)	30(13.39%)	24(10.71%)	$2.51 \pm 1.30$
20. To express fear and concern about death and dying	71(31.70%)	69(30.80%)	40(17.86%)	27(12.05%)	17(7.59%)	$2.33 \pm 1.25$
21. The meaning of life lasts forever after death	92(41.07%)	56(25.00%)	32(14.29%)	20(8.93%)	24(10.71%)	$2.23 \pm 1.35$
22. Whenever death comes, always treat it with peace of mind	47(20.98%)	52(23.21%)	50(22.32%)	46(20.54%)	29(12.95%)	$2.81 \pm 1.33$
23 Take responsibility for your own life, participate in the treat- ment of illness, decision-making	11(4.91%)	54(24.11%)	44(19.64%)	56(25.00%)	59(26.34%)	3.44±1.25
Total score for spiritual needs						70.88±19.38

### **Multifactorial analysis**

In this study, the independent variables for the multiple linear regression analysis were identified based on variables with p < 0.05 in the univariate analysis results. The dependent variable was spiritual needs. In this study, categorical independent variables were assigned, and dummy variables and reference groups were established as detailed in Supplementary Form 4. Continuous independent variables were directly incorporated into the regression model using their original values. In the multiple linear regression analysis, the correlation coefficient was < 0.7, the tolerance of all independent variables was>0.1, and the Variance Inflation Factor (VIF) values ranged from 1.072 to 2.279, indicating no collinearity among independent variables. The residuals met the requirements of normality, homogeneity of variance and independence.

The multiple linear regression equation for overall spiritual needs was significant (F=6.972, p<0.001), with a Durbin-Watson (D-W) statistic of 1.642 and an adjusted R<sup>2</sup> of 0.337, as presented in Table 9.

Multiple linear regression equation for love and connection spiritual needs was significant (F=9.691, p < 0.001), with a D-W statistic of 1.728, and an adjusted  $R^2 = 0.300$ , as shown in Table 10. The multiple linear regression equation for hope and peace spiritual needs was significant (F=12.165, p < 0.001), with a D-W statistic of 1.834 and an adjusted  $R^2$  of 0.375, as shown in Table 11. The multiple linear regression equation for meaning and purpose spiritual needs was significant (F=6.383, p < 0.001), with a D-W statistic of 1.905 and an adjusted  $R^2$  of 0.386, as shown in Table 12. The multiple linear regression equation for spiritual needs related to a relationship with the transcendent was significant

Items	M (P25-P75)	Н	Р
Age		5.352	0.069
≤40 years old	75.00(52.00,81.00)		
41–60 Years old	77.00(58.00,89.50)		
>60 Years old	69.00(52.50,86.50)		
Gender		0.017	0.897
Male	76.00(52.00,87.00)		
Female	70.00(58.00,83.00)		
Marital status		2.288	0.515
Married	72.00(53.00,86.00)		
Widowed / divorced	95.00(52.00,95.00)		
Unmarried	70.00(60.50,76.50))		
Degree of education		5.44	0.245
Primary school and below	70.00(54.00,88.50)		
Junior middle school	79.00(53.00,84.00)		
High school or technical secondary school	78.00(60.50,82.50)		
Junior college	57.00(49.00.80.00)		
BAching painlor degree or above	51.50(48.00.74.00)		
Religious affiliation		56.892	< 0.001*
Buddhism	81 00(71 00 89 00)		
Christianity	89 00(87 00 92 00)		
Other religion affiliations	76.00(67.00.90.50)		
No religion affiliation	54 00(49 00 71 00)		
Per capita monthly household income	51.00(19.00), 1.00)	0.657	0.720
< 3000 vuan	71 00(54 00 83 00)	0.057	0.720
3001–5000 vuan	72 00(51 00 89 00)		
> 5000 yuan	79.00(66.00.82.00)		
	79.00(00.00,02.00)	9.639	0.086
	71 50(53 00 82 00)	2.052	0.000
Mapual workers	70.00(60.00.00.00)		
	70.00(00.00,50.00) 86.00(54.50.80.50)		
Businessman	88 50 76 00 93 00)		
	67.00(51.50.84.00)		
Healthcare payment method	07.00(31.30,64.00)	20 202	< 0.001*
New rural cooperative	81.00(66.00.00.00)	50.505	< 0.001
	58 50(53 00 83 00)		
Municipal medical insurance	74.00(52.00,83.00)		
	74.00(32.00,62.00)		
	54.00(46.00,09.00)		
At ones own expense	00.00(00.00,78.00)	9.071	0.01.1*
	74.00(40.00.96.00)	8.971	0.011**
City	74.00(49.99,80.00)		
TOWNS	66.00(53.00,83.00)		
Village	81.00(60.00,88.00)	F F F 1	0.062
Smoking		5.551	0.062
Yes	74.00(62.50,84.50)		
Deny	67.00(51.00,86.00)		
Ever suck	/8.00(63.00,86.00)	1001	0.0.15*
Alconol use	70.00/52.00.06.00	4.094	0.043*
Deny	/0.00(53.00,86.00)		
Ever drink	80.00(69.00,86.50)		

Table 3 Univariate analysis of sociodemographic data on the overall spiritual needs of patients with terminal cancer

\* Indicates statistical significance

Items	M (P25-P75)	Н	Р
Tumor type		14.335	0.073
Thoracic tumor	78.00(59.50,91.50)		
Lymphadenoma	74.00(74.00,76.00)		
Urinary system tumor	48.00(48.00,85.00)		
Head and neck tumor	88.00(65.00,88.00)		
Breast tumor	46.50,45.00,48.00)		
Gynecological tumor	58.50,47.00,70.00)		
Digestive system tumor	70.00(53.50,83.00)		
Bone tumor	60.00(52.00,60.00)		
Therapeutic regimen		5.613	0.230
Simple chemotherapy	74.00(50.00,88.00)		
Simple radiotherapy	72.00(60.00,78.50)		
chemoradiotherapy	76.00(70.00,83.00)		
Immune or targeted therapy	72.00(58.00,81.00)		
Undetermined treatment	45.00(44.50,49.00)		
Body mass index		5.105	0.078
< 18.5	78.00(67.00,87.00)		
18.5–23.9	69.00(51.00,83.00)		
≥24	74.00(53.50,89.00)		
ECOG score		8.575	0.073
0 points	71.00(50.00,84.50)		
1 points	73.00(54.00,86.50)		
2 points	69.00(57.00,88.00)		
3 points	79.00(57.00,81.00)		
4 points	48.00(48.00,48.00)		

**Table 4** Univariate analysis of clinical characteristics on the overall spiritual needs of patients with terminal cancer

\* Indicates statistical significance

(F=6.242, p < 0.001), with a D-W statistic of 1.841 and an adjusted R<sup>2</sup> of 0.273, as shown in Table 13. All models exhibited no autocorrelation, with residues being independent of each other, and the models fit well.

The result of multiple linear regression analysis for acceptance of death spiritual needs indicated that the equation was not valid (F=1.787, p=0.065), suggesting that the included independent variables were not helpful in predicting the spiritual needs of patients with terminal cancer.

## Discussion

## Analysis of the current spiritual needs of patients with terminal cancer

One of the objectives of this study was to investigate the spiritual needs of patients with terminal cancerin in southern China. The results of this study, indicated that the overall spiritual needs score of patients with terminal cancer in southern China was relatively high. The highest average score was for hope and peace. This finding is inconsistent with the previous study by Shi et al.

**Table 5** Univariate analysis of pain characteristics on the overall spiritual needs of patients with terminal cancer

н Ρ Items M (P25-P75) Pain frequency 4.725 0317 No pain 62.50(41.00,84.00) Intermittent pain 69.00(53.00,83.50) Persistent pain 74.00(54.00,86.00) Pain during activity 75.00(52.50,81.00) Periodic pain 86.00(83.00,95.00) Pain properties 18.884 0.026\* Not applicable 62.50(41.00.84.00) Dull pain 70.50(52.50,86.00) Distending pain 66.00(49.00,81.00) Colic pain 69.00(59.50,79.00) Stabbing pain 81.00(81.00,95.00) Stuffy pain 75.00(60.00,88.00) Cutting pain 78.00(61.50,95.00) Aching pain 74.50,56.00,87.00) Crushing pain 89.50(76.00,94.00) Throbbing pain 46.50(42.00,59.00) 7.134 0.028\* Number of pain sites No pain 62.50(41.00,84.00) 70.50(53.00,83.50) Single site pain Pain in 2 or more areas 88.50(75.00,95.00) Indicates statistical significance

[24]. The cross-sectional findings suggest that patients with terminal cancer have a stronger need to express love and accept care from others. Although this study also found that patients with terminal cancer expressed a strong need for love and connection, such as "having a warm or caring person for me", participants believed that maintaining hope for life, reducing pain, and achieving inner peace were more important. Hope is considered a positive expectation for cancer patients to pursue health[35]. The research by Sun et al. [27] also confirms this view, Peace of mind has been shown to be an effective tool for dealing with difficulties, and inner peace is positively related to the perception of health.

In this study, a connection to the supernatural was rated as the least important spiritual need among patients with terminal cancer, which is consistent with previous findings [8, 27]. The supernatural is considered to be closely related to spiritual beliefs and metaphysics. Although China is a multi-religious country and is very inclusive of secularism, it is essentially a socialist country, which is not contradictory. Most Chinese citizens are influenced by socialist philosophy, and it seems difficult for them to feel the connection with the supernatural compared to those with clear religious beliefs.

ltems	Love and conr	nection		Hope and peac	a		Meaning and p	ourpose		Relationship v transcendent	vith		Acceptance of	death	
	M (P25-P75)	т	4	M (P25-P75)	т	4	M (P25-P75)	т		M (P25-P75)	т	4	M (P25-P75)	т	4
Age		4.730	0.094		6.963	0.031*		4.335	0.114		9.069	0.011*		5.411	0.067
≤ 40 years old	3.00(2.40,4.30)			4.00(2.60,4.75)			3.33(2.42,4.00)			2.00(1.33,2.33)			2.20(2.00,2.60)		
41–60 Years old	3.60(2.80,4.20)			4.00(3.13,4.50)			3.33(2.33,4.08)			2.33(1.33,3.67)			2.60(2.00,3.60)		
> 60 Years old	3.50(2.40,4.20)			3.25(2.50,4,25)			2.83(2.17,3.83)			2.00(1.33,3.67)			2.60(2.00,3.20)		
Gender		1.87	0.172		0.005	0.946		0.641	0.423		4.609	0.032*		1.250	0.264
Male	3.20(2.40,4.00)			3.75(2.50,4.50)			3.17(2.33,4.00)			2.00(1.33,3.00)			2.60(2.00,3.60)		
Female	3.60(2.60,4.40)			3.75(2.75,4.50)			3.17(2.33,3.67)			2.33(2.00,3.33)			2.20(2.00,3.20)		
Marital status		0.989	0.804		1.388	0.708		1.093	0.779		2.713	0.438		2.588	0.460
Married	3.40(2.60,4.20)			3.75(2.75,4.50)			3.17(2.33,4.00)			2.00(1.33,3.33)			2.60(2.00,3.40)		
Widowed / divorced	4.40(2.40,4.40)			4.00(2.75,4.00)			4.00(2.33,4.00)			4.33(1.67,4.33)			4.00(2.00,4.00)		
Unmarried	3.60(3.20,3.90)			3.00(2.75,4.00)			3.75(2.67,4.00)			2.00(1.83,2.50)			2.10(2.00,2.30)		
Degree of education		3.832	0.429		15.045	0.005*		10.671	0.031*		7.068	0.132		2.875	0.579
Primary school and below	3.30(2.40,4.00)			3.50(2.50,4.25)			3.00(2.17,4.00)			2.33(1.50,4.00)			2.40,2.00,3.40)		
Junior middle school	3.60(2.40,4.40)			4.00(3.00,4.50)			3.42(2.50,4.00)			2.00(1.33,3.33)			2.60(2.00,3.40)		
High school or techni- cal secondary school	3.60(3.00,4.20)			4.13(2.88,4.75))			3.33(2.58,4.17)			1.67(1.00,3.00)			2.60(2.10,3.10)		
Junior college	2.90(2.60,4.00)			3.25(2.50,3.75)			2.33(2.00,3.33)			1.83(1.33,3.00)			2.30(1.80,3.20)		
BAching painlor degree or above	2.60(2.40,3.80)			2.50(2.50,4.00)			2.42(2.33,3.33)			1.33(1.33,2.33)			2.00(1.60,2.40)		
Religion affiliation		50.009	< 0.001*		62.873	< 0.001*		60.941	< 0.001*		29.069	< 0.001*		13.029	0.005*
Buddhism	4.00(3.00,4.40)			4.25(3.50,5.50)			3.67(3.33,4.17)			2.33(2.00,4.00)			2.70(2.00,3.80)		
Christianity	4.50(4.40,4.60)			4.25(3.88,4.50)			2.75(3.33,4.25)			3.67(2.67,4.00)			3.60(2.60,3.90)		
Other religion affili- ations	3.80(3.60,4.50)			4.75(4.13,4.75)			3.17(3.17,3.67)			2.00(1.00,3.83)			2.40(2.60,3.70)		
No religion affiliation	2.60(2.40,3.80)			2.75(2.88,4.50)			2.33(2.00,2.83)			1.67(1.33,2.33)			2.40(2.00,2.80)		
Per capita monthly household income		0.231	0.891		0.129	0.938		0.583	0.747		3.194	0.203		2.763	0.251
≤ 3000 yuan	3.60(2.40,4.20)			3.75(2.50,4.50)			3.17(2.33,4.00)			2.00(1.33,3.00)			2.40(2.00,2.80)		
3001–5000 yuan	3.40(2.60,4.00)			3.75(2.75,4.50)			3.00(2.33,4.00)			2.00(1.33,3.67)			2.80(1.70,3.60)		
> 5000 yuan	3.20(2.80,4.10)			3.25(3.13,4.00)			3.33(3.17,3.50)			3.00(2.00,4.00)			2.80(2.20,3.80)		
Occupation		9.894	0.078		7.448	0.189		6.436	0.266		12.519	0.028*		10.473	0.063
Unemployed	3.20(2.40,4.00)			3.50(2.50,4.50)			3.00(2.33,4.00)			2.00(1.33,3.00)			2.60(2.00,3.20)		
Manual workers	3.60(2.60,4.20)			4.00(3.00,4.75)			3.42(2.33,4.50)			2.33(2.00,3.33)			2.60(2.00,3.60)		
TeAching painr or clerk	4.40(2.80,4.40)			4.00(3.00,4.25)			3.33(2.25,3.67)			3.00(1.83,3.33)			2.80(1.80,3.70)		

Table 6 Univariate analysis of sociodemographic data on the spiritual needs of patients with terminal cancer in each dimension

Table 6 (continued)															
Items	Love and con	nection		Hope and pead	ė		Meaning and I	purpose		Relationship w transcendent	vith		Acceptance of	death	
	M (P25-P75)	- -		M (P25-P75)	т	4	M (P25-P75)	т	4	M (P25-P75)	т	4	M (P25-P75)	т	<u>م</u>
Businessman	4.20(4.00,4.60)			4.00(3.75,4.75)			3.17(2.83,4.00)			3.33(2.00,4.33)			3.40(3.00,3.60)		
Other job	3.40(2.40,3.80)			3.75(2.75,4.25)			3.17(2.33,3.33)			1.33(1.00,3.00)			2.00(1.60,2.60)		
Healthcare payment method		21.567 (	0.001*		35.567	< 0.001*		34.055	< 0.001*		28.832	< 0.001*		10.465	0.063
New rural cooperative	4.00(2.80,4.40)			4.13(3.50,4.50)			3.67(2.83,4.17)			2.33(2.00,4.00)			3.00(2.00,3.80)		
Urban medical insur- ance	3.20(2.20,4.50)			3.00(2.75,4.75)			2.50(2.33,3.83)			1.33(1.00,1.83)			2.50(2.20,2.60)		
Municipal medical insurance	3.20(2.60,4.00)			3.75(2.75,5.00)			3.25(2.33,4.33)			2.33(1.00,3.50)			2.50(1.80,2.80)		
Provincial medical insurance	2.60(2.40,3.60)			2.75(2.50,3.50)			2.50(2.33(2.83)			2.00(1.33,2.33)			2.20(1.60,2.80)		
At one's own expense	3.60(3.60,3.60)			3.00(2.75,4.75)			2.50(2.33,3.00)			2.33(2.00,2.33)			2.00(2.00,3.20)		
Place of Residence		12.986 (	0.002*		5.581	0.061		8.287	0.016*		4.438	0.109		2.601	0.272
City	3.20(2.60,4.00)			3.75(2.50,5.00)			3.33(2.33,4.33)			2.00(1.00,3.67)			2.60(1.80,3.60)		
Towns	3.00(2.40,4.00)			3.50(2.50,4.13)			2.83(2.33,3.33)			2.00(1.33,3.00)			2.40(2.00,3.20)		
Village	4.00(2.80,4.40)			4.00(2.75,4.50)			3.67(2.50,4.00)			2.33(1.67,4.00)			2.60(2.00,3.60)		
Whether to smoke		6.866 (	0.032*		9.791	0.007*		8.979	0.011*		0.457	0.796		2.088	0.352
Yes	3.10(2.10,3.90)			3.38(2.25,4.38)			2.83(1.92,3.67)			1.67(1.00,3.17)			2.30(1.90,3.20)		
Deny	3.20(2.40,4.00)			3.50(2.50,4.50)			2.83(2.33,3.83)			2.00(1.33,3.33)			2.40(2.00,3.20)		
Ever suck	3.70(2.80,4.40)			4.00(3.25,4.75)			3.50(3.00,4.17)			2.00(1.33,3.33)			2.60(2.00,3.60)		
Whether to drink		7.179 (	3.007*		1.252	0.263		4.529	0.033*		1.433	0.231		3.031	0.082
Deny	3.20(2.40,4.20)			3.75(2.63,4.50)			3.00(2.33,4.00)			2.00(1.33,3.33)			2.40(2.00,3.20)		
Ever drink	4.00(2.80,4.40)			3.88(3.25,4.63)			3.50(3.00,4.08)			2.17(1.83,3.67)			3.00(2.00,3.80)		
* Indicates statistical significa	ance														

ltems	Love and conr	lection		Hope and pea	e		Meaning and	purpose		Relationship w transcendent	ith		Acceptance of	death	
	M (P25-P75)	н	Ь	M (P25-P75)	н	Ъ	M (P25-P75)	н	٩	M (P25-P75)	т	4	M (P25-P75)	н	Ь
Tumor type		9.663	0.289		14.441	0.071		19.933	0.011*		14.464	0.070		15.853	0.045*
Thoracic tumor	3.60(2.60,4.20)			4.25(3.25,4.88)			3.67(2.83,4.50)			2.33(1.33,3.67)			3.00(2.00,3.60)		
Lymphadenoma	3.80(3.80,3.80)			4.00(3.25,4.00)			3.33(3.33,3.50)			2.33(2.33,3.00)			2.40(2.40,2.80)		
Urinary system tumor	2.40(2.40,4.00)			2.50(2.50,4.88)			2.33(2.33,4.42)			1.33(1.00,1.33)			1.60(1.60,2.70)		
Head and neck tumor	3.80(3.60,4.40)			4.25(3.75,4.25)			3.67(2.83,4.00)			4.00(2.00,4.00)			2.60(2.20,2.60)		
Breast tumor	2.40(2.40,2.40)			2.63(2.50,2.75)			2.17(2.17,2.17)			1.17(1.00,1.33)			1.50(1.20,1.80)		
Gynecological tumor	2.60(2.60,2.60)			3.25(2.25,4.25)			3.17(2.00,4.33)			1.67(1.33,2.00)			1.70(1.40,2.00)		
Digestive system tumor	3.20(2.60,4.40)			3.50(2.50,4.25)			3.00(2.30,3.80)			2.00(1.33,3.33)			2.40(2.00,3.40)		
Bone tumor	3.60(2.80,3.60)			3.00(3.00,3.00)			2.33(2.33,2.33)			2.00(1.67,2.00)			2.00(2.00,2.00)		
Therapeutic regimen		5.244	0.263		6.092	0.192		7.662	0.105		8.455	0.076		5.280	0.260
Simple chemotherapy	3.60(2.40,4.40)			3.75(2.50,4.50)			3.17(2.33,4.00)			2.00(1.33,3.33)			2.60(2.00,3.60)		
Simple radiotherapy	3.30(3.00,4.00)			4.25(3.25,5.00)			3.67(3.17,4.33)			2.33(1.67,3.00)			2.60(2.40,2.80)		
Chemoradiotherapy	3.20(2.80,3.60)			3.25(3.00,5.00)			3.00(2.33,4.33)			2.00(1.00(3.17)			2.60(2.00,3.30)		
Immune or targeted therapy	2.70(3.60,4.20)			3.88(2.75,4.50)			3.17(2.33,3.67)			2.33(1.83,3.33)			2.30(2.00,2.90)		
Undetermined treatment	2.40(2.20,2.40)			2.75(2.63,3.25)			2.17(2.00,2.25)			1.00(1.00,1.17)			1.60(1.50,1.70)		
Body mass index		4.156	0.125		8.532	0.014*		7.374	0.025*		0.090	0.956		1.695	0.429
< 18.5	3.60(3.20,4.00)			4.00(3.25,4.75)			3.83(2.33,4.33)			2.00(1.00,4.33)			2.60(2.20,4.00)		
18.5-23.9	3,20(2.40,4.20)			3.50(2.50,4.25)			3.00(2.33,3.75)			2.00(1.33,3.00)			2.40(2.00,3.20)		
≥ 24	3.80(2.40,4.60)			3.88(2.63,4.75)			3.00(2.50,3.83)			2.00(1.17,3.67)			2.60(1.80,3.40)		
ECOG score		13.081	0.011*		8.064	0.089		6.704	0.152		4.030	0.402		10.396	0.034*
0 points	4.00(2.60,4.40)			3.50(2.38,4.25)			2.50(2.00,4.00)			2.00(1.33,4.17)			2.40(2.00,2.80)		
1 points	3.40(2.50,4.10)			4.00(2.75,4.50)			3.17(2.33,4.00)			2.00(1.33,3.33)			2.60(2.00,3.60)		
2 points	3.20(2.80,4.00)			3.50(2.75,4.50)			2.83(2.33,3.83)			2.33(2.00,2.33)			2.60(2.20,3.40)		
3 points	4.00(2.80,4.40)			3.75(2.88,4.63)			3.50(2.50,4.00)			2.33(1.83,3.00)			2.20(2.00,3.00)		
4 points	2.40(2.10,2.40)			2.50(2.50,2.50)			2.33(2.25,2.33)			1.33(1.17,1.33)			1.60(1.60,1.60)		
* Indicates statistical significance															

Table 7 Univariate analysis of clinical characteristics on the spiritual needs of patients with terminal cancer in each dimension

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Items	Love and connection	Hope and peace	Meaning and purpose	Relationship with the transcendent	Accepta nce of death	Overall spiritual needs	Fatigue	Heaviest pain intensity	Lightest pain intensity	Average pain intensity	Present pain intensity	Overall pain intensity
Love and connection	-											
Hope and peace	0.740**	<del>-</del>										
Meaning and purpose	0.663**	0.828**	-									
Relationship with the transcendent	0.531**	0.361**	0.480**									
Acceptance of death	0.535**	0.521**	0.656**	0.633**	<del>,</del>							
Overall spiritual needs	0.835**	0.834**	0.886**	0.705**	0.822**	-						
Fatigue	-0.08	-0.166*	-0.133*	0.032	0.057	-0.068	-					
Heaviest pain intensity	0.115	0.082	-0.002	0.142*	0.149*	0.103	0.420**	—				
Lightest pain intensity	0.222**	0.110	0.077	0.037	0.049	0.128	0.175**	0.351**	<i>(</i>			
Average pain intensity	0.269**	0.146*	0.084	0.168*	0.135*	0.187**	0.353**	0.741**	0.688**	<del>, -</del>		
Present pain intensity	0.102	0.030	0.095	0.148*	0.054	0.098	0.223**	0.306**	0.426**	0.415**	-	
Overall pain intensity	0.190**	0.108	0.056	0.145*	0.110	0.138*	0.393**	0.830**	0.699**	0.900**	0.623**	-
* indicates a significant cor	rrelation at the 0	0.05 level (bilateral) and	-									
** indicates a significant co	orrelation at the (	0.01 level (bilateral)										

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Items	Variable	В	SE	Beta	t	р	95%Cl		tolera	VIF
	(constant)	68.527	2.969		23.078	< 0.001	62.673	74.382	nce	
religion affiliation	Buddhism	17.388	2.481	0.447	7.008	< 0.001	12.496	22.280	0.730	1.370
	Christianity	20.701	6.158	0.199	3.362	0.001	8.560	32.842	0.851	1.176
	Other religion affiliations	18.960	6.023	0.182	3.148	0.002	7.085	30.836	0.889	1.125
Place of residence	town	-5.788	2.740	-0.142	-2.113	0.036	-11.190	-0.387	0.656	1.524
	city	-4.147	3.251	-0.094	-1.276	0.204	-10.557	2.263	0.548	1.826
Healthcare payment method	Urban medical insurance	-6.312	4.148	-0.093	-1.522	0.130	-14.491	1.867	0.794	1.260
	Municipal medical insurance	-4.139	3.788	-0.079	-1.093	0.276	-11.608	3.330	0.574	1.742
	Provincial medical insurance	-7.871	3.133	-0.173	-2.512	0.013	-14.049	-1.693	0.626	1.596
	At one's own expense	-7.390	5.707	-0.075	-1.295	0.197	-18.643	3.862	0.884	1.131
Pain properties	Not applicable	-4.998	11.609	-0.024	-0.431	0.667	-27.886	17.891	0.932	1.074
	Distending pain	-4.647	3.074	-0.114	-1.512	0.132	-10.708	1.414	0.521	1.919
	Colic pain	7.324	5.308	0.085	1.380	0.169	-3.141	17.790	0.778	1.286
	stabbing pain	1.991	4.990	0.025	0.399	0.690	-7.848	11.830	0.761	1.314
	stuffy pain	2.780	3.528	0.054	0.788	0.432	-4.176	9.736	0.634	1.578
	Cutting pain	6.479	9.936	0.039	0.652	0.515	-13.111	26.070	0.852	1.174
	Aching pain	-4.617	4.482	-0.065	-1.030	0.304	-13.454	4.220	0.748	1.336
	Crushing pain	12.251	8.325	0.084	1.472	0.143	-4.164	28.665	0.914	1.094
	Throbbing pain	-18.446	8.312	-0.126	-2.219	0.028	-34.834	-2.057	0.917	1.091
Number of pain sites	Single site pain	15.076	5.478	0.161	2.752	0.006	4.276	25.877	0.868	1.152

Table 9 Multiple regression analysis of the overall psychiatric needs of patients with terminal cancer

F = 6.972, P < 0.001,  $R^2 = 0.394$ , adjusted for  $R^2 = 0.337$ , D-W = 1.642

# Factors influencing the spiritual needs in patients with terminal cancer

In the univariate analysis, religious affiliation, healthcare payment method, residence, alcohol use, pain properties, and number of pain sites were identified as factors affecting the overall spiritual needs of patients with terminal cancer. Additionally, correlation analysis revealed that average and overall pain intensity were positively correlated with the overall spiritual needs. Multiple linear regression models identified religious affiliation, residence, healthcare payment method, pain properties, and the number of pain sites as predictors of overall spiritual needs. Among them, the top three predictors of overall spiritual needs were religious affiliation, healthcare payment method, and the number of pain sites.

The study also explored the influencing factors of spiritual needs in each domain, with religious affiliation and healthcare payment method showing significant predictive power. The results of this study found that patients with clear religious beliefs were adept at seeking supernatural support, hope, or internal strength [23], which increased their confidence in treating disease and relieving pain [6]. This is consistent with the studies by Puchalski et al.[19] and Peiwen et al. [17]. Patients without a religious background in this study were more likely to seek personal peace of mind or to experience the process of loving and being loved in interpersonal relationships.

As far as we know, no previous studies have reported a relationship between healthcare payment method and the spiritual needs of patients with terminal cancer. This may be related to the health insurance reform policies in China in recent years. Southern China was the first to implement a government-led integrated reform policy for healthcare, medical insurance, and pharmaceuticals. Unlike other regions, the reimbursement rate of urban medical insurance is gradually approaching that of provincial and municipal medical insurance, reducing the economic pressure on urban medical insurance residents with lower living costs [16]. According to Maslow's hierarchy of needs theory, when economic pressure is reduced, residents are better able to meet their basic needs and are more likely to pursue higher spiritual needs<sup>[25]</sup>. This also explains why residence became a major influencing factor of some domain-specific spiritual needs in this study.

The results of multiple linear regression in this study found that pain intensity was predictive of spiritual needs in the love and connection, hope and peace domains. This finding is similar to that of Riklikiene et al. [21], who conducted a cross-sectional survey of 227 cancer patients and found that pain intensity was the strongest predictor of patient survival, inner peace, and the need for giving/creation and forgiveness. However, regarding the relationship between pain intensity and overall spiritual

ltems	variable	В	SE	Beta	t	р	95%Cl		tolerance	VIF
	(constant)	14.155	0.822		17.218	< 0.001	12.534	15.775		
pain	Average pain intensity	0.923	0.267	0.203	3.451	0.001	0.396	1.450	0.908	1.102
religion affiliation	Buddhism	2.846	0.595	0.303	4.781	< 0.001	1.673	4.020	0.780	1.282
	Christianity	5.977	1.476	0.238	4.050	< 0.001	3.068	8.887	0.911	1.098
	Other religion affiliations	6.265	1.469	0.249	4.266	< 0.001	3.370	9.161	0.920	1.087
Healthcare payment method	Municipal medical insurance	0.825	0.946	0.065	0.872	0.384	-1.040	2.689	0.566	1.766
	Provincial medical insurance	-1.582	0.778	-0.144	-2.034	0.043	-3.114	-0.049	0.626	1.598
	At one's own expense	0.765	1.388	0.032	0.551	0.582	-1.971	3.502	0.919	1.088
	Urban medical insurance	0.739	1.036	0.045	0.714	0.476	-1.302	2.780	0.784	1.276
Place of residence	town	-1.924	0.670	-0.196	-2.872	0.004	-3.245	-0.603	0.675	1.481
	city	-2.192	0.831	-0.206	-2.639	0.009	-3.830	-0.555	0.516	1.937
Whether to drink	Ever drink	1.607	0.776	0.126	2.069	0.040	0.076	3.137	0.841	1.190

Table 10 Multiple regression analysis of love and connection spiritual needs in patients with terminal cancer

F = 9.691, p < 0.001,  $R^2 = 0.335$ , adjusted for  $R^2 = 0.300$ , D-W = 1.728

needs, this study does not provide a definitive answer. Although correlation analysis revealed a significant correlation between the pain intensity and spiritual needs, this relationship disappeared in the multiple linear regression analysis. This suggests that even if pain intensity is associated with overall spiritual needs, its effect on spiritual needs becomes negligible after accounting for other factors and additional domains of spiritual needs. This is inconsistent with the findings of Robinson et al. [22], who reported that moderate to severe pain better predicted spiritual distress in hospice patients. Ethnic and cultural differences may explain this discrepancy. The The population in Robinson et al.'s [22] study was from hospice care centers, indicating that most patients had accepted the inevitability of death. However, China lacks independent hospice care centers due to the traditional Chinese view of life, where the desire for and discussion of life far exceed the acceptance of death [39]. Even though the final stage of life is characterized by intense pain, Chinese patients still hold onto the expectation of survival. This may be one reason why pain intensity does not significantly affect the overall spiritual needs of patients with terminal cancer in China. Shi et al. [24] found that cancer-related fatigue is a major factor affecting the spiritual needs of patients with terminal cancer. However, this study did not find a predictive effect of fatigue on spiritual needs, which differs from findings of Shi et al. [24]. This discrepancy may be related to the study participants, who were all patients with terminal cancer undergoing long-term follow-up, with an expected survival time of less than or equal to 6 months. For these patients, these adverse symptoms may have been suffered for a long time, so fatigue symptoms seem difficult to directly affect the spiritual needs of patients in the last stage of life. Subsequent studies can incorporate established confounders into the model for better control.

It is important to note that this study found that pain properties and the number of pain sites continued to affect the meaning and purpose domain and overall spiritual needs in patients with terminal cancer, even after multiple linear regression analysis. This suggests that more urgent pain symptoms can lead to increased needs and expectations for finding meaning, goals, and values in life. In this study, colic, as a type of spasmodic intense pain, was found to be a more serious challenge than the dull pain. Patients with colic had stronger spiritual needs for meaning and purpose compared to those with dull pain. Additionally, patients with multiple pain sites had stronger spiritual needs for meaning and purpose than those with a single pain site. This finding is consistent with that of Klimasinski et al. [12], who suggested that spiritual distress is associated with the severity of illness.

# Nursing insights on the spiritual needs of patients with terminal cancer

In this study, the desire for spiritual needs among patients with terminal cancer was generally evident, yet the content and degree of spiritual needs varied among individual patients. Although we attempted to identify patterns of spiritual needs based on sociodemographic data, individual differences remained, probably because other factors also significantly influence spiritual needs [34]. For example, Wang Canfei's study [3] found that social support and psychological resilience have both direct and indirect effects on the spiritual needs of breast cancer patients. Therefore, spiritual care for patients with terminal cancer should consider not only sociodemographic data but also other patient-related factors, and

ltems	variable	в	SE	Beta	t	ď	95%CI		tolerance	VIF
	(constant)	11.963	0.690		17.333	< 0.001	10.602	13.323		
Pain	Average pain intensity	0.470	0.215	0.121	2.184	0:030	0.046	0.894	0.914	1.094
Degree of education	BAching painlor degree or above	0.291	1.142	0.015	0.255	0.799	-1.960	2.543	0.801	1.248
	junior college	-0.456	1.011	-0.029	-0.451	0.652	-2.450	1.537	0.657	1.521
	High school or technical secondary school	1.560	0.646	0.150	2.416	0.017	0.287	2.833	0.729	1.372
	Junior middle school	1.197	0.521	0.139	2.296	0.023	0.169	2.224	0.764	1.310
Religion affiliation	Buddhism	3.091	0.488	0.385	6.334	< 0.001	2.129	4.053	0.758	1.320
	Christianity	3.286	1.193	0.153	2.754	0.006	0.934	5.638	0.910	1.099
	Other religion affiliations	5.607	1.206	0.261	4.649	< 0.001	3.229	7.984	0.890	1.123
Healthcare payment method	Urban medical insurance	-1.241	0.781	-0.089	-1.589	0.114	-2.781	0.299	0.899	1.113
	Municipal medical insurance	-0.250	0.701	-0.023	-0.356	0.722	-1.632	1.132	0.672	1.487
	Provincial medical insurance	-2.850	0.627	-0.304	-4.543	< 0.001	-4.087	-1.613	0.627	1.594
	At one's own expense	-2.858	1.115	-0.141	-2.564	0.011	-5.055	-0.661	0.931	1.074
F = 12.165, <i>p</i> < 0.001, <i>R</i> <sup>2</sup> = 0.409, adju	isted for $R^2 = 0.375$ , D-W = 1.834									

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project	variable	В	SE	Beta	t	р	95%CI		tolerance	VIF
	(constant)	19.924	1.051		18.961	< 0.001	17.852	21.996		
Religion affiliation	Buddhism	5.760	0.750	0.492	7.681	< 0.001	4.281	7.239	0.671	1.490
	Christianity	5.759	1.855	0.184	3.104	0.002	2.100	9.418	0.787	1.271
	Other religion affiliations	5.520	1.756	0.176	3.144	0.002	2.058	8.982	0.879	1.138
Healthcare payment method	Urban medical insurance	-1.373	1.211	-0.067	-1.134	0.258	-3.761	1.015	0.782	1.278
	Municipal medical insurance	-0.984	1.122	-0.062	-0.877	0.381	-3.197	1.228	0.549	1.820
	Provincial medical insurance	-2.105	0.929	-0.154	-2.266	0.025	-3.937	-0.273	0.599	1.671
	At one's own expense	-3.116	1.967	-0.105	-1.584	0.115	-6.995	0.762	0.625	1.599
Place of residence	Town	-1.636	0.806	-0.134	-2.030	0.044	-3.226	-0.047	0.636	1.572
	City	-1.055	0.964	-0.079	-1.095	0.275	-2.957	0.846	0.523	1.912
Tumor type	Lymphadenoma	2.953	2.378	0.075	1.242	0.216	-1.736	7.642	0.756	1.323
	Urinary system tumor	-3.637	1.941	-0.109	-1.873	0.063	-7.465	0.192	0.818	1.223
	Head and neck tumor	-3.054	2.300	-0.078	-1.328	0.186	-7.590	1.481	0.808	1.238
	Breast tumor	2.365	4.782	0.038	0.494	0.622	-7.066	11.795	0.461	2.169
	Gynecological tumor	0.096	3.361	0.002	0.029	0.977	-6.533	6.725	0.933	1.072
	Digestive system tumor	-2.449	0.892	-0.201	-2.746	0.007	-4.208	-0.690	0.517	1.935
	Bone tumor	-3.510	2.403	-0.097	-1.461	0.146	-8.250	1.229	0.619	1.614
Pain properties	Distending pain	-1.140	0.926	-0.093	-1.231	0.220	-2.967	0.686	0.482	2.074
	Colic pain	3.251	1.573	0.126	2.067	0.040	0.149	6.353	0.744	1.344
	Stabbing pain	0.369	1.466	0.015	0.251	0.802	-2.522	3.260	0.741	1.350
	Stuffy pain	-0.348	1.068	-0.022	-0.326	0.745	-2.454	1.758	0.581	1.722
	Cutting pain	1.769	2.977	0.035	0.594	0.553	-4.101	7.640	0.797	1.255
	Aching pain	-3.423	1.391	-0.160	-2.461	0.015	-6.167	-0.68	0.652	1.533
	Crushing pain	1.832	2.421	0.042	0.757	0.450	-2.943	6.607	0.907	1.102
	Throbbing pain	-8.470	3.559	-0.193	-2.38	0.018	-15.488	-1.452	0.420	2.381
Number of pain sites	No pain	0.334	3.378	0.005	0.099	0.921	-6.327	6.995	0.924	1.082
	Pain in 2 or more areas	5.523	1.618	0.196	3.413	0.001	2.332	8.714	0.835	1.197

Table 12 Multiple regression analysis of meaning and purpose spiritual needs in patients with terminal cancer

F = 6.383, p < 0.001,  $R^2 = 0.457$ , adjusted for  $R^2 = 0.386$ , D-W = 1.905

 Table 13
 Multiple regression analysis of relationship with the transcendent spiritual needs in patients with terminal cancer

project	variable	В	SE	Beta	t	р	95%Cl		tolerance	VIF
	(constant)	3.176	0.756		4.198	< 0.001	1.684	4.667		
Age	41–60 Years old	2.842	0.633	0.366	4.488	< 0.001	1.594	4.091	0.491	2.038
	>60 Years old	3.290	0.661	0.429	4.975	< 0.001	1.986	4.593	0.439	2.279
Gender	Female	1.082	0.469	0.139	2.309	0.022	0.158	2.006	0.900	1.112
Religion affiliation	Buddhism	2.887	0.521	0.379	5.536	< 0.001	1.859	3.915	0.695	1.438
	Christianity	4.303	1.281	0.211	3.358	0.001	1.777	6.829	0.827	1.210
	Other religion affiliations	1.029	1.279	0.050	0.805	0.422	-1.492	3.551	0.830	1.205
Occupation	Manual workers	0.475	0.626	0.049	0.758	0.449	-0.760	1.709	0.782	1.278
	Teaching painr or clerk	0.606	1.094	0.035	0.554	0.580	-1.550	2.763	0.836	1.196
	Businessman	3.785	1.389	0.161	2.726	0.007	1.048	6.523	0.930	1.076
	Other	1.155	0.960	0.074	1.204	0.230	-0.737	3.047	0.866	1.155
Healthcare payment method	Urban medical insurance	-2.685	0.820	-0.202	-3.274	0.001	-4.302	-1.068	0.854	1.170
	Municipal medical insurance	-0.578	0.721	-0.056	-0.801	0.424	-1.999	0.844	0.666	1.501
	Provincial medical insurance	-0.504	0.664	-0.057	-0.759	0.448	-1.813	0.805	0.587	1.704
	At one's own expense	-0.576	1.154	-0.030	-0.500	0.618	-2.851	1.699	0.910	1.099

F = 6.582, p < 0.001,  $R^2 = 0.322$ , adjusted for  $R^2 = 0.273$ , D-W = 1.840

provide personalized spiritual care based on the content and degree of the patient's spiritual needs.

#### Limitations

It should be acknowledged that this study has certain limitations. First, the inclusion of patients from three hospitals in China generates potential cultural and clinical heterogeneity due to variations in disease types and symptoms, potentially limiting the representativeness of the sample. Second, some objective factors resulted in a relatively small sample size. Third, the widely adopted the spiritual needs scale(SNS) may exhibit cultural bias, as it appears more applicable to religious populations. Low scores on certain items (e.g., relationship with the transcendent domain) might reflect unexpressed or latent needs rather than a lack of relevance to non-religious patients. In light of these limitations, future studies should consider increasing the sample size and promoting the development of practical and localized measurement tools that cater to the diverse needs of cancer patients. This would provide evidence-based clinical guidance for the comprehensive and accurate assessment of the dynamic needs of cancer patients.

### Conclusion

This study demonstrated that the factors influencing each type of spiritual need vary. Specifically, pain properties and the number of pain sites can impact the overall spiritual needs of patients with terminal cancer. Although the degree of pain has minimal influence on overall spiritual needs, patients experiencing severe pain tend to place greater emphasis on their spiritual needs in the two domains of love and connection, hope and peace. Additionally, the spiritual need for acceptance of death is not associated with patients' sociodemographic data and pain. Future research should consider exploring the influencing factors of this spiritual needs to aid in the development of death education within the context of traditional Chinese culture. In conclusion, spiritual care for patients with terminal cancer should be personalized based on the content and degree of their spiritual needs.

### Supplementary Information

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Supplementary Material 1.

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#### Authors' contributions

Fang Zhu was responsible for the implementation and management of the research. Zilan Wu was responsible for analyzing the data and writing the manuscript. Dun Liu was responsible for the quality control of data analysis. Hongyu Zhu, Yan Lin and LingYang were responsible for data collection. Jinyuan Lin enrolled the participants and was responsible for collecting and entering data. Xi Ke directed the study conception and design. All authors discussed the results and contributed to the final manuscript.

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#### Data availability

Data can be obtained by contacting the first author or corresponding author by email.

#### Declarations

#### Ethics approval and consent to participate

This study was approved by the Internal Review Board Fujian Provincial Cancer Hospital Ethics Committee (K2021-031–01) and strictly followed the ethical behavior standards for social behavior research. Each participant signed an informed consent form. Human Ethics and Consent to Participate declarations information is provided in the Supplementary material.

#### **Consent for publication**

All authors acknowledge their contributions and agree to the publication of this article. All participants in the survey signed informed consent forms and consented to data publication.

#### **Competing interests**

The authors declare no competing interests.

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