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Death anxiety and its relationship with family function and meaning in life in patients with advanced cancer—A cross-sectional survey in China

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ABSTRACT

Objective: This study explores the factors influencing death anxiety in patients with advanced cancer, and to investigate the role of family function on death anxiety, and the correlation between meaning in life and death anxiety.

Methods: Patients with advanced cancer who were hospitalized in three institutions from November 2020 to May 2021 were recruited in this cross-sectional study. The Chinese version of the Death and Dying Distress Scale, Meaning in Life Scale For Advanced Cancer Patients and Family APGAR Index were used to assess death anxiety, meaning in life and family function. Pain symptoms were evaluated by the Numeric Rating Scale. Karnofsky Performance Status, patients' socio-demographic and clinical variables were also recorded. Statistical analyses were performed using IBM SPSS Statistics for Windows (version 26.0). Multivariate regression analysis was performed to examine the correlations of social-demographic and clinical variables with family function and death anxiety.

Results: Three hundred and twenty-eight patients with advanced cancer were included in this study. The results showed that 12.2% of patients experienced moderate to severe death anxiety. Meaning in Life Scale For Advanced Cancer Patients (acceptance of death, controlling one's life), types of institution (oncology department of tertiary hospitals), self-perceived economic burden (extreme), Karnofsky Performance Status score, age, and medical insurance status (self-paid, inter-provincial medical insurance) were identified as associated factors of death anxiety ($R^2 = 0.335$, $F = 20.072$, $P < 0.001$). Patients with good family function scores had significantly low level of death anxiety in univariate analysis ($F = 5.892$, $P = 0.003$). Multivariate analysis revealed no significant association between family function and death anxiety.

Conclusions: Our results demonstrated that the oncology department of a tertiary hospital, extremely high of self-perceived economic burden, self-pay, and inter-provincial medical insurance might be associated with higher death anxiety in patients with advanced cancer. Lower level death anxiety was associated with higher level acceptance of death, a greater sense of life control, better physical performance, and older age. Further confirmation about the association between family function and death anxiety in patients with advanced cancer is warranted in the future.

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Introduction

Cancer has become a serious global major health issue globally. The International Agency for Research on Cancer reported that about 19.29 million new cancer cases and 9.96 million cancer-related deaths worldwide in 2020.[1] Approximate number of 4.57 million new cancer cases and 3 million deaths were confirmed from China, accounting for 23.7% and 30.1% globally.[2] Most patients with cancer were diagnosed at the middle or advanced stages, forfeiting the best treatment opportunity.[3,4] Patients with terminal cancer were psychologically threatened by death and bear a huge burden of disease.[5,6]

Death anxiety is a conscious or unconscious state of mind in humans to activate defense mechanisms when facing the threat of death[7,8] and is the basis or a strong explanation for many mental disorders.[9,10] Studies have shown that patients with advanced cancer commonly experience death anxiety[7,11–14] and may even develop intensified death anxiety. One study revealed that more than 43% of patients with advanced cancer suffered from moderate to severe death anxiety.[14]

Death anxiety has been reported to be negatively correlated with life satisfaction,[15] reducing quality of life,[16] causing distress to families,[16] and seriously affecting physical and mental health, as well as the prognosis of patients with cancer.[17] Additionally, it can become a barrier to advance care planning and end-of-life preparation.[18] The presence of death anxiety may lead to a desire to hasten death.[19] If left unaddressed, euthanasia or physician-assisted suicide may be performed.[20] Death anxiety has been listed as a nursing diagnosis by The official North American Nursing Diagnosis Association International,[21] and relief of death anxiety is deemed to be a necessity of caring for terminally ill patients in palliative care.[12,22]

Previous research findings indicated that cultural, socio-demographic factors, and clinical characteristics influence the level of death anxiety.[23–26] Moreover, cancer type,[23] VAS score,[27] having children under 18,[7] burden of pain,[7] and gender[28] were shown to be associated with death anxiety in patients with advanced cancer. Meaning in life appears to be significantly correlated with death anxiety in older adults and patients with cancer.[29–31] Meaning in Life is considered when an individual feels guided by valuable goals and feels valuable in life.[32] Family support, such as providing emotional communication, social support, and helping in dealing with stressful life events, is the primary source of meaning in life.[11,23,33–35] Establishing and maintaining close relationships with significant family members and friends could be beneficial for individuals to cope with the fear of death.[36] Although family function and meaning in life significantly affect patients with advanced cancer, the relationship between family function and death anxiety in these terminally ill patients has not yet been reported.

Due to the uniqueness of Chinese cultural attitudes and beliefs toward death,[1,37] research on death anxiety and its associated factors in Chinese patients with advanced cancer may greatly advance cross-cultural knowledge in this field. However, there is a very minute quantity of studies that directly examine Chinese patients with advanced cancer attitudes toward death. One study[38] reported that the death anxiety of patients with advanced cancer was associated with adult children, low daily activities, and aggressive coping mode (resignation and confrontation). One death anxiety evaluation tool, 5-point Likert-type Chinese Version of Templer-Death Anxiety Scale (CL-TDAS), was not specifically developed to assess advanced cancer due to some non-cancer-specific items, and patients' psychological and physiological changes were ignored.[39] The Chinese version of the Death and Dying Distress Scale (DADDS-C) was used in this study to evaluate death anxiety in patients with advanced cancer. The psychological characteristics and sensitivity of death anxiety-related factors have been extensively validated by DADDS-C.[12,40] Thus, this study aimed to fulfill the knowledge gap by exploring the relationship between death anxiety and certain psychosocial variables of Chinese patients with advanced cancer. Furthermore, the relationship between family function, meaning in life, and death anxiety in these patients were investigated.

Methods

Participants and procedures

We conducted a cross-sectional investigation of death anxiety in patients with advanced cancer who were hospitalized in three medical institutions. The sample size was calculated using the Kendall method,[41] which stated that the sample size estimates for multivariate linear regression could be 10 to 20 times the number of variables number. With about 20 independent variables in this study, and given that 20% of the questionnaires were invalid, at least 240 {(1 + 20%)* 10* 20} patients were needed in this study.

We recruited participants voluntarily by convenience sampling from November 2020 to May 2021. Participants were recruited over a 4-month period in the oncology department of a tertiary general hospital and a secondary general hospital in Shantou, and over a 3-month period in a tumor center of a tertiary hospital in Zhuhai, China. Patients were enrolled if they were aged 18 or older, diagnosed with stage III or IV cancer, able to read and write Chinese. Patients who refused to participate in the study, had cognitive impairment and were in a critical condition were excluded from this survey.

A research nurse, who described the study purpose, contents, and potential benefits/risks of the study to all participants in the same way, collected all questionnaires. After informed consent was obtained, participants were invited to complete the questionnaires by themselves. When a patient could not complete the questionnaire, the research nurse read the items verbally and recorded the patient's responses. All questionnaires was returned to the researchers on the spot after the participants completed it. The average time for completing the questionnaire was 28.4 ± 11.3 (21–43) min.

This study was approved by the Ethics Committee of the First Affiliated Hospital of Shantou University Medical College (Approval No. 20190112).

Measures

Socio-demographic and clinical characteristics

The following demographic and clinical data were obtained from participants at recruitment and were also extracted from the medical record: age, gender, marital status, education level, employment status, medical insurance status, religion, caregiver employment status, types of institution, self-perceived economic burden, having children under 18 of age, unmarried children, time since confirmed diagnosis, types of cancer, and Numeric Rating Score (NRS)[42] that was most widely used as a single dimension pain assessment scale. The patients were allowed to mark their pain scores varying from 0–10 (0 indicated painless, 1–3 mild pain, 4–6 moderate pain, and 7–10 severe pain). Performance status was defined using Karnofsky Performance Status (KPS) score,[43] which was an eleven point scale suggesting the correlation with the percentage score ranging from 0 to 100 (indicating normal, no signs, or symptoms to death). The higher score signified less physical impairment.

Family APGAR index[44]

Family APGAR Index was a measurement to explore the patient's satisfaction with family function (FA), which included five parameters: adaptation, partnership, growth, affection, and resolve. This index was introduced in 1978 and validated for the Chinese population in 1995. The responses of each dimension (item) related to 'almost always', 'some of the time' and 'hardly ever', were scored as 2 points, 1 point, and 0 points, respectively. Thus, these scores ranged from 0 to 10 representing low to high satisfaction with family function: 7–10 indicating good family function; 4–6 indicating moderate family dysfunction; 0–3 indicating severe family dysfunction. The test-retest reliability of the questionnaire was 0.80–0.83. The Chinese version of APGAR has been widely applied in China with excellent validity and reliability.[45] In this study, Cronbach's α of this scale was 0.83.

Meaning in life scale for advanced cancer patients[46]

Meaning in life scale for advanced cancer patients (MiLS) was used to assess meaning in life, which was a self-report questionnaire consisting of 28 items, with each question answered on a five-point scale. All items were classified into 6 dimensions[31]: meaning and satisfaction in life (the extent to which an individual had a clear, strong, and meaningful life purpose and was satisfied with his/her life purpose), control of life (the extent to which an individual was free to make life choices and was responsible for his/her life), will to seek meaning (the motivation of an individual to seek meaning for self-existence), bearing suffering (the extent to which an individual understood the meaning of suffering and accepted it), existential frustration (the extent to which an individual suffered from existential frustration caused by the lack of meaning or purpose and the feeling of emptiness and anxiety), and acceptance of death (the extent to which an individual was not afraid of death). MiLS was testified to have good internal consistency in Chinese patients with advanced cancer (Cronbach's $\alpha = 0.725$, 0.577–0.736 for each dimension).[46] Higher score indicated having a greater meaning in life. In this research, Cronbach's α of MiLS was 0.772.

DADDS-C

DADDS-C was used to measure death anxiety. DADDS that was developed to evaluate individuals with advanced or metastatic cancer, broadly captured distress about the loss of time and opportunity, the process of death, and dying and their impact on others.[12] A total of 15 items were used to assess death anxiety, with each item corresponding to the options on a 6-point Likert scale ranging from 0 (no distress) to 5 (extreme distress). Total DADDS scores varied from 0 to 75, with higher scores indicating more significant death anxiety. Chen et al[40] formulated the Chinese Version Scale (DADDS-C) in 2016 with the CVI value of each item on the scale being between 0.875 and 1.000. The overall Cronbach's α coefficient was 0.960, proving that it could be used to evaluate the death anxiety of patients with advanced cancer in China. In this study, Cronbach's α coefficient on the scale was 0.909. We also used 45 points to identify individuals with at least a moderate level of death anxiety, as this value was rated as '3' (experiencing moderate distress) across 15 items of the scale.[7,47]

Data analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, N.Y., USA).[48] All significant tests were two-tailed with a significance level of $P < 0.05$. Descriptive statistics including means, standard deviations, and frequencies were calculated for demographic and clinical variables including MiLS score, the total score of DADDS-C as well as each item. Independent T-tests and one-way ANOVA were performed to compare continuous dependent variables (total DADDS-C score) to show the differences in family function, socio-demographic, and clinical variables.

The associations between the MiLS, Age, KPS score, NRS score, and DADDS-C were explored by using Spearman rank correlation.

Multiple linear regression adjusted for confounders were performed to examine the correlation between social-demographic and clinical variables, MilS, family function, and death anxiety. To identify the significant factors associated with total DADDS-C score, variables with a $P < 0.20$ in the univariate analysis were included in multivariate linear stepwise regression models, with all of classification variables being changed to dummy variables.[49]

Results

Participants' characteristics

A total of 362 patients with advanced cancer were surveyed, and 328 valid questionnaires were recovered, yielding a 90.61 percent effective recovery rate. Patients' age was 56.6 ± 12.3 years (range 21–85 years), and the time since diagnosis was 25.5 ± 30.7 months (range 1–187 months). The KPS score was 69.6 ± 17.1 points (range 10–100 points), and the NRS score was 0.6 ± 1.1 points (range 0–7 points). Other detailed socio-demographic and clinical characteristics of the participants are presented in Table 1 and Table 2.

Table 1
Socio-demographic and the associations with the DADDS-C in patients with advanced cancer ($n = 328$).

Variables	*n* (%)	Mean score	SD score	Significant
Gender				
Male	183 (55.8)	24.46	16.08	0.423*
Female	145 (44.2)	25.83	14.34	
Marital status				
Unmarried/Widowed/ Divorced	49 (14.9)	23.63	14.99	0.479*
Married	279 (85.1)	25.32	15.40	
Education Level				
Primary school and below/Junior high school	183 (55.8)	25.47	14.77	0.591*
High school/Secondary technical school/ College or higher	145 (44.2)	24.55	16.04	
Religion				
No	161 (49.1)	23.47	15.33	0.067*
Yes	167 (50.9)	26.55	15.06	
Employment status				
Employed	99 (30.2)	25.33	15.75	0.818*
Unemployed/retired	229 (69.8)	24.91	15.06	
Primary caregiver				
Spouse	162 (49.4)	26.26	15.36	0.209**
Child/children	88 (26.8)	25.00	15.48	
Others	78 (23.8)	22.54	14.64	
Primary caregiver Employment status				
Employed	160 (48.8)	25.41	16.13	0.663*
Unemployed/retired	168 (51.2)	24.68	14.40	
Whether having children under 18 of age				
No	264 (80.5)	24.45	14.48	0.208*
Yes	64 (19.5)	27.58	18.34	
Unmarried children				
No	163 (49.7)	22.54	14.00	0.003*
Yes	165 (50.3)	27.56	16.19	
Self-perceived economic burden				
Extreme	105 (32.0)	29.98	16.09	< 0.001**
Severe	78 (23.8)	25.56	13.68	
Moderate	99 (30.2)	21.81	14.72	
Mild	31 (9.4)	20.77	14.70	
None at all	15 (4.6)	18.40	14.36	

SD: Standard deviation.
* Independent *t*-tests.
** One-way ANOVA.

Death anxiety

The total death anxiety score was 25.1 ± 15.3 points (range 0–71). A total of 40 (12.2%) of the patients presented with moderate to severe death anxiety (scores ≥ 45). Fig. 1 shows the frequency of patients reporting each item (scores ≥ 3 indicating at least moderate distress). The most frequent concerns were as follows: being a burden to others (68.9%), the impact of death on loved ones (59.5%), and not having a future (42.4%). Notably, even the least frequent concern (distress being prolonged or drawn out) was reported by 14.3% of participants.

Perceived sense of meaning in life

The total MiLS score was 107.77 ± 12.95 points (range 70–136). The score of 6 dimensions are presented in Table 3.

Univariate analysis

The analysis of the variables associated with DADDS-C indicated that patients having unmarried children ($P = 0.003$), bearing self-perceived

Table 2
Clinical status, family function, and the associations with the DADDS-C in patients with advanced cancer ($n = 328$).

Variables	*n* (%)	Mean score	SD score	Significant
Types of Institution				
Oncology Section of Secondary Hospital	75 (22.9)	25.20	15.26	< 0.001**
Oncology Department of Tertiary Hospitals	82 (25.0)	30.57	13.82	
Tumor Center of Tertiary Hospital	171 (52.1)	22.36	15.41	
Medical insurance status				
Municipal Health Insurance	232 (70.7)	24.63	15.59	0.123**
Provincial Medical Insurance	53 (16.2)	24.53	14.52	
Inter-Provincial Medical Insurance	29 (8.8)	24.07	11.86	
Institutional Payment/Free	3 (0.9)	37.04	26.28	
Self-paid	11 (3.4)	35.36	13.86	
Types of cancer				
Nasopharynx	17 (5.2)	18.89	15.48	0.219**
Esophagus	11 (3.4)	23.55	17.65	
Stomach	25 (7.6)	25.88	14.84	
Lung	64 (19.5)	27.64	15.82	
Breast	44 (13.4)	27.25	13.43	
Liver	11 (3.4)	32.91	14.44	
Colon/rectum	89 (27.0)	23.48	14.99	
Gynecological	21 (6.4)	24.05	13.72	
Lymphoma	14 (4.3)	19.00	13.77	
Others	32 (9.8)	24.82	17.46	
Time since confirmed diagnosis (months)				
< 12	161 (49.1)	25.48 ± 15.69	0.124	0.883**
12–36	89 (27.1)	24.54 ± 16.23		
> 36	78 (23.8)	24.79 ± 13.57		
Family function (FA)				
Severe family dysfunction	12 (3.7)	27.50	23.91	0.003**
Moderate family dysfunction	47 (14.3)	31.85	14.14	
Good family function	269 (82.0)	23.77	14.79	

SD: Standard deviation.
Tumor center of tertiary hospital is distinguished by the presence of multiple oncology departments, which can be classified as head and neck oncology, thoracic oncology, and so on. Each department has its own bed and treats patients with specific conditions, such as nasopharyngeal cancer of the head and neck. In a word, the tertiary hospital's tumor center, is made up of several oncology departments. Tumor center of tertiary hospital in this study has more than 300 beds.
Oncology department of tertiary hospitals does not categorize the tumor types, and has a small number of beds. Oncology department of tertiary hospitals in this study have fewer than 40 beds.
Others in 'Types of cancer' including Pancreas, Prostate, Kidney, Bladder, Mandible, Neck, Pleural, Thymus, Gallbladder, Ampullary, Testicle, Peritoneum, Ewing sarcomas, Synoviosarcoma, Osteosarcoma, and undefined.
** One-way ANOVA

economic burden (extremely high) ($P < 0.001$), hospitalized in certain institution (oncology department of tertiary hospitals) ($P < 0.001$), and had moderate family dysfunction ($P < 0.003$) experienced a high level of death anxiety (Table 1 and Table 2). Death anxiety was significantly associated with age, KPS score, NRS score, and MiLS (total score and the scores of five dimensions except for "will seek meaning"). NRS score was positively correlated with death anxiety ($r = 0.133$), and other variables were negatively correlated with death anxiety (r = -0.112∼-0.251) (Table 4).

Multiple linear regression analysis

Multivariate regression analysis suggested that death anxiety was positively correlated with institution type (oncology department of tertiary hospitals), self-perceived economic burden (extremely high), and medical insurance status (inter-provincial medical insurance and self-paid). Death anxiety was negatively correlated with MiLS (acceptance of death and controlling life), KPS score, and age (Table 5).

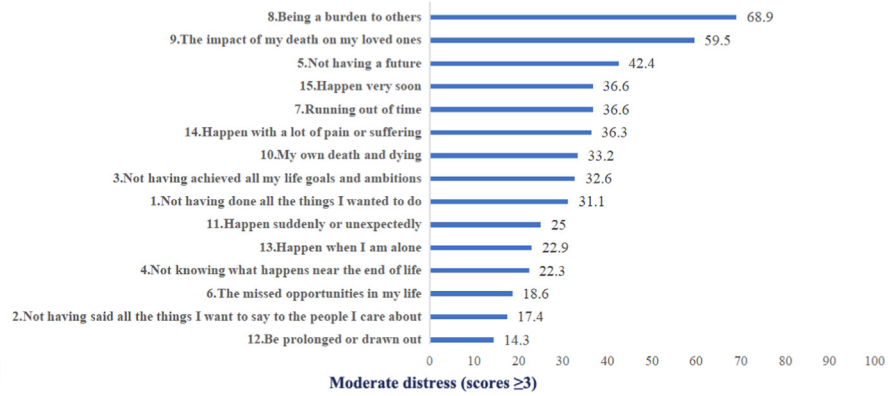

Fig. 1. Frequency of patients reporting each item (cut-off ≥ 3 indicating at least moderate distress) of DADDS-C ($n = 328$) Fig. 1. Frequency of each item ($n = 328$). Moderate distress is defined by item ratings ≥ 3. The question stem for items 1 to 10 was 'Over the past 2weeks, how distressed did you feel about … '. And The question stem for items 11 to 15 was over the past 2weeks, how distressed did you feel when thinking about your death may.

Table 3
Mean scores on the MiLS.

Variables	Mean score	SD score	Range
Will to seek meaning	15.48	3.20	7–20
Existential frustration	19.42	3.31	8–25
Meaning and satisfaction in life	14.47	3.03	7–20
Controlling one's life	28.70	4.05	8–35
Bear suffering	14.69	3.35	4–20
Acceptance of death	15.10	2.83	5–20

Table 4
Correlations of DADDS-C with age, MiLS (total score, each dimension), NRS score, and KPS score.

Variable		Death anxiety
Age		−0.112*
KPS score		−0.218**
NRS score		0.133*
MiLS	Total score	−0.251**
	Will to seek meaning	0.002
	Existential frustration	−0.211**
	Meaning and satisfaction in life	−0.194**
	Controlling one's life	−0.238**
	Bear suffering	−0.116*
	Acceptance of death	−0.360**

**$P < 0.001$; *$P <$ 0.05, Will to seek meaning: $P = 0.974$.

Discussion

In this study, we found that death anxiety in patient with advanced cancer were associated with MiLS, institution, self-perceived economic burden, KPS score, age, and medical insurance status. Contrary to previous studies, we did not find any correlation between having children under 18 years[7] and death anxiety. Patients with higher family function scores had significantly lower death anxiety in univariate analysis, but it turned out that family function was not the associated factors of death anxiety based on multivariate analysis.

In this study, 40 (12.2%) patients with advanced cancer reported moderate to severe death anxiety based on a cut-off score of 45 on DADDS-C, which was lower than the results from previous studies (27.4%–45%).[7,12,14,47] The most and the least distressing items identified in our study were inconsistent with previous findings.[7,47] Examination results revealed that the percentage of patients suffering moderate to extreme distresses was calculated based on a cut-off score of 3 on each item of DADDS-C, which classifying moderate to extremely distress on 2 of 15 items. The item rated as most distressing on DADDS-C was 'asked about being a burden to others', which suggested that death anxiety was significantly associated with patients' perceived meaning in life (his/her importance to others) and close relationship with family members. The DADDS-C items rated as minimum distress with concerning fear along with the thought of death and dying may be prolonged or drawn out. The low level of distress about the thought of death 'be prolonged or drawn out' and 'not having said all the things I want to say to the people I care about' might indicate the presence of less consciousness to death or non-acceptance of forthcoming mortality, or meaningful medical care and family support for most individuals participating this study.

Perceived meaning in life was negatively correlated with death anxiety, so meaning in life might be a protective factor against death anxiety. This finding was consistent with previous results and Terror Management Theory.[29,50] The novelty of this finding lied in the main construction of explanation factors. First, the dimension of 'acceptance of death' was the extent to which an individual was not afraid of death, the dimension 'control of life' was the extent to which an individual was free to make life choices and was responsible for his/her life. Both 'acceptance of death' and 'control of life' were identified to be the primary protective factors against death anxiety in this study, which indicated that people with lower death anxiety were not afraid/denied of death and could plan for their own death. Unlike Terror Management Theory, people deny death and tend to obtain meaning through a set of cultural worldviews and beliefs, which may promote a sense of symbolic immortality against the fear of death. Second, the dimension 'will to seek meaning' (the motivation of an individual to seek meaning and a purpose for self-existence) was not the associated factor of death anxiety, which was inconsistent with the finding that searching for meaning in life was negatively correlated with death anxiety of Chinese college students and the elderly.[30,51] Thus, the specificity of this population may be highlighted in future research into meaning in life, death anxiety, and the relationship between them.

The institution where patient was hospitalized was correlated with death anxiety, with the highest level of death anxiety among hospitalized patients in the oncology department of tertiary hospitals. Notably, patients' hospitalization costs in tertiary general hospitals may be generally higher than those in secondary general hospitals.[52] Besides, in comparison with the cancer center of tertiary hospital, the beds in the oncology department of tertiary hospitals are more crowded, and the relevant specialties are not clearly divided, which will complicate the treatment, nursing, and education of specialized diseases, and the patients are more concerned about the tumors. Thus, it is necessary to carry out tumor-related knowledge education, and comprehensively coordinate the diagnosis and treatment resources of different types/levels of medical institutions, so that patients can obtain a better experience in consultation and treatment, help reducing patients' anxiety about death.

Self-perceived economic burden (extremely high) was strongly associated with death anxiety in patients with advanced cancer. According to a National Cancer Center survey, the annual per capita medical expenses for patients with malignant tumor ($9739) far outweigh their families' average annual income ($8607).[53] Cancer treatment really brings a huge economic pressure for individuals and their families. Aside from the symptom burden imposed by the disease itself,[54] side effects associated with anti-tumor therapy or maintenance therapy add to patients'

Table 5
Regression of death anxiety on key explanatory factors ($n = 328$).

Variable	*B*	*Beta*	*t*	*P*	95%CI
Constant	86.342	–	11.646	< 0.001	71.756–100.927
MiLS (Acceptance of death)	−2.032	−0.374	−8.038	< 0.001	−2.529~-17.368
Types of institution (Oncology Department of Tertiary Hospitals)	8.894	0.252	5.326	< 0.001	5.608–12.179
Self-perceived economic burden (Extreme)	6.388	0.195	4.142	< 0.001	3.354–9.423
KPS score	−0.192	−0.214	−4.196	< 0.001	−0.282~-0.102
Age	−0.202	−0.163	−3.301	0.001	−0.323~-0.082
Medical insurance status (Inter-Provincial Medical Insurance)	6.66	0.124	2.572	0.011	1.566–11.754
Medical insurance status (Self-paid)	9.048	0.106	2.302	0.022	1.314–16.783
MiLS (Controlling one's life)	−0.382	−0.101	−2.047	0.041	−0.750~-0.015

Independent variables: DADDS-C score.
$R = 0.579$, $R^2 = 0.335$, adjust $R^2 = 0.318$, $F = 20.072$, $P < 0.001$.
"-"indicates that the data does not exist.

economic, physical, and mental burdens. Studies have shown that nearly one-quarter of patients experience moderate to severe depression and low morale,[55,56] as well as suicidal ideation/desire to hasten death.[55,57] Depression, low morale, and the desire to hasten death are associated with death anxiety.[14,58,59] As a result, the participating institutions need to pay more attention to the financial support of patients with advanced cancer and give them more economic help to reduce the negative impact of self-perceived economic burden and to promote the adjustment of patients themselves.

Performance status was negatively correlated with death anxiety in this study. We found that patients with low KPS scores might have greater anxiety than those with higher KPS scores. The patient with a lower KPS score would have more physical dysfunction, increasing actual dependency on others and additional self-perceived burden they may face.[4,60] To call a nurse or family members frequently for help such as eating, disposing of urine and stools, and so on may lead them to feel meaningless of life, loss of dignity, even desire for hastened death.[61–63] Thus, in clinical practice, attention should be paid to the assessment of the physical state and activity of patients with advanced cancer in order to take appropriate measures to improve self-care ability, prevent and reduce the production of related negative emotions.

There remained a negative association between death anxiety and age, consistent with the life-stage perspective and the previous research findings.[64,65] Older individuals may have more capacity to manage a traumatic event and more frequent contemplation of death. Instead, younger patients may face the issue of child dependence. Some of the children are minors, and they will consider the support of their children if they die. The negative effects of lacking parental companionship in the process of growing up, and being more concerned about their children's future, will lead to an increased level of death anxiety.[7] As a result, future clinical staff should pay more attention to the death anxiety level of younger patients with advanced cancer.

Otherwise, medical insurance status (self-paid, and inter-provincial medical insurance) were positively correlated with death anxiety. Dealing with cancer is a significant financial stress for individuals, their families, and the community is enormous but has micro effects on disease. ‘Poverty reinstatement due to illness’ and ‘poverty due to illness’ were not rare in China and was known by the patient and their family members. ‘Self-paid’ indicates that all the cost of treatment is paid, which is undoubtedly a great burden. As for inter-provincial medical insurance, it might reflect the phenomenon of remote medical treatment such as[66]: (1) ineligible for instant reimbursement; (2) decreasing reimbursement rate; (3) increasing of expense incurred for living; (4) narrowed reimbursement list, and so on, which may significantly increase direct and indirect economic burdens for them, bring a lot of inconveniences. Thus, participating departments may improve the disease-related insurance system for patients with advanced cancer, mediating reimbursement. Medical insurance status (self-paid and inter-provincial medical insurance) should be paid more attention by medical staff to promote the smooth flow of medical treatment and settlement, reducing patients' pressure.

Family function was not found to be associated with death anxiety in multivariate linear analysis. This finding was contrary to expectation but might be explained by sample size-related differences in family function. The frequency of patients with good family function in this study was 82%, those patients with moderate to severe family dysfunction was only 18%. Thus, exploring the relationship between family function and death anxiety may be less sensitive and representative. Family function directly reflects the degree of support provided by the family to individual, the intimacy between family members, and the ability to solve problems together and coping with stress.[44] It is closely related to the patient's health status and can assist patients in maintaining psychological, social, and mental health. Patients suffering from family dysfunction may lack emotional connection and effective communication with family members, resulting in unneeded, ununderstood, unappreciated, serious self-burden, meaningless life, falling into a state of self-isolation, and finally choosing to avoid addressing all issues.[67] When the disease progresses, the burden of physical symptoms increases and body function declines. There is severe emotional distress, which eventually leads to death anxiety. Nevertheless, future research to clarify the nature of family function that is correlated with death anxiety and the influence of different family functions on the level of death anxiety is needed.

Limitations of this study were as follows: first, our study failed to make any causal inference as it was a cross-sectional study. Second, our findings were indicative but it should be interpreted with caution, as it might only apply to patients with advanced cancer in the neighborhood area. Third, for exploring associated factors of death anxiety, some variables may be less sensitive and representative due to convenience sampling method rather than purpose sampling method. At the same time, literature review suggested that physical symptoms, self-esteem, attachment security,[7] attachment avoidance,[68] anxiety, depression, and demoralization[14,58,68] were correlated with death anxiety. Finally, we did not involve and analyze the interaction or the intermediary role between various factors, which need to be further explored in future studies.

Conclusions

In conclusion, first, patients’ age, performance status, perceived meaning in life, self-perceived economic burden, medical insurance status, and types of institution were important factors associated with death anxiety. Among them, self-perceived economic burden (extremely high), medical expense support (self-pay and inter-provincial medical insurance), and participating institution (oncology department of tertiary hospital) might be associated with higher death anxiety in patients with advanced cancer. Lower levels of death anxiety in patients were associated with higher levels of meaning in life (higher acceptance of death, and greater sense of life control), older age, and better physical performance. Second, the association between family functions with death anxiety may need to be further examined. Finally, based on the findings of our study, we suggested to guide patients with advanced cancer to view the changes in physical function and the economic pressure caused by treatment from multiple perspectives, and accept the inevitability of death, which may help to relieve death anxiety. Moreover, further research on specific interventions and their effects is warranted.

Author contributions

Conceived and designed the analysis: Hui Liu, Wenjuan Ying, Xiaocheng Liu, Zhili Liu, Yanchun Wu. Collected the data: Hui Liu. Contributed data or analysis tools:Hui Liu, Ruihua Zheng, Rongzhi Xie, Hongmei Tao, Xiaocheng Liu. Performed the analysis: Hui Liu, Yao Wang, Zhili Liu, Xiaomin Li. Wrote the paper: Hui Liu, Xiaoying Wu, Ruiling Feng, Yao Wang.

Declaration of competing interest

None declared.

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Ethics statement

This study was approved by the Ethics Committee of the First Affiliated Hospital of Shantou University Medical College (Approval No. 20190112).

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