Article

Predictors of Psychiatric Complications in Patients with Pancreatic Cancer: A Retrospective Cohort Study

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Abstract

Background: The relevant survey has shown a high incidence of psychiatric complications in patients with pancreatic cancer. While some studies have explored the factors influencing psychological complications in pancreatic cancer patients, some factors validated in other populations have not been confirmed in the pancreatic cancer population. This study aims to explore the predictors of psychiatric complications in patients with pancreatic cancer.

Methods: Patients with pancreatic cancer admitted to Yueqing People's Hospital Affiliated to Wenzhou Medical University, from January 2021 to January 2022 were retrospectively analyzed. The structured clinical interview (SCID-I) based on Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) was used by nurses to assess the incidence of psychiatric complications during hospitalization (baseline) and 3 months after the start of treatment. Binary logistic regression was used to identify predictors of psychiatric complications.

Results: 80 patients were enrolled in this study and 8 patients were diagnosed with psychiatric complications at base line. Among the rest 72 patients, 8 patients (11.11%) had new-onset psychiatric complications at 3-month follow-up. Gender (Odds Ratio (OR) = 1.674, p = 0.019), monthly income (OR = 1.735, p = 0.023) and sadness (M.D. Anderson Symptom Inventory (MDASI)) (OR = 1.804, p = 0.001) were all predictors for psychiatric complications in patients with pancreatic cancer.

Conclusions: Gender, monthly income and MDASI score are predictors of psychiatric complications in patients with pancreatic cancer.

Keywords

pancreatic cancer; psychiatric complications; depression; predictors

Introduction

As one of the more common malignant tumors in clinical practice, pancreatic cancer has a high malignant degree, and its frequent initial symptoms include upper abdominal discomfort and abdominal pain [1–3]. Patients with pancreatic cancer suffer from severe physical and psychological pain, and most patients have mental health problems and are prone to psychiatric complications. The psychiatric complication, referring to the mental disorder, is characterized by a clinically significant disturbance in an individual's cognition, emotional regulation, or behaviour.

The relevant survey has shown a high incidence of psychiatric complications in patients with pancreatic cancer, and the incidences of depression and anxiety were 34% and 49%, respectively [4]. Another investigation shows that the incidence of psychiatric complications in patients with pancreatic cancer is approximately 31% [5]. Psychiatric complications are factors affecting the survival rate of patients with pancreatic cancer, which result in adverse effects on the psychological states and social functions of patients, and are not conducive to the rehabilitation of patients [6,7]. Therefore, it is of great significance to actively analyze the influencing factors of psychiatric complications in patients with pancreatic cancer, in order to provide targeted

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mental health services in combination with patients' mental health problems, thus establishing the thorough treatment and nursing guidelines and system.

Factors influencing psychological complications in pancreatic cancer patients have been a complex subject, with some insights provided by existing research. One study has indicated that age is an important factor affecting the psychological symptom burden in pancreatic cancer patients, with younger age being associated with a higher risk of depression [8]. However, there is another study showing that depressive symptoms in cancer patients decrease with increasing age [9]. Gender may also be related to the mental health of pancreatic cancer patients, with female patients being more susceptible to depression and other psychological complications [10]. Patients' economic status and education level [11], as well as the severity of cancer and treatment modalities [12], may directly impact their mental health, although this has not been validated in the pancreatic cancer population. In addition to demographic and clinical indicators, psychosocial factors are also important determinants of patients' mental health. For example, family functioning, self-efficacy, and coping strategies may all influence patients' psychological adaptation [13,14]. These studies provide strong support for a deeper understanding of the factors influencing psychological complications in cancer patients, offering guidance and insights for future research and clinical practice.

While some studies have explored the factors influencing psychological complications in pancreatic cancer patients, some factors validated in other populations have not been confirmed in the pancreatic cancer population. Furthermore, most studies have focused on the occurrence of common psychological complications such as depression and anxiety, with limited research on other types of psychological complications. Therefore, this study has investigated the incidence and influencing factors of psychiatric complications in patients with pancreatic cancer, and focused on more complications including dysthymic disorder and post-traumatic stress disorder other than depression and anxiety. This study aims to provide a reference for the development of clinical intervention programs, thus reducing the incidence of psychiatric complications in patients with pancreatic cancer.

Subjects and Methods

Research Subjects

The clinical data of patients with pancreatic cancer admitted to Yueqing People's Hospital Affiliated to Wenzhou Medical University, from January 2021 to January 2022 were selected for retrospective analysis. The inclusion criteria were as follows: (1) All patients were diagnosed with pancreatic cancer by pathological examination, with the main pathological types including ductal adenocarcinoma, small gland carcinoma, and adenoalveolar cell carcinoma; (2) the age of middle-aged or elderly patients $\geq$50 years old; (3) patients without any known psychiatric complication, such as depression, anxiety, post-traumatic stress disorder, or dysthymic disorder, at the time of consultation; (4) the informed consent was obtained from patients. Exclusion criteria: (1) patients had cognitive impairment and no method to cooperate with the study; (2) patients died during the study; (3) patients had missing follow-up.

This study has been approved by the ethics committee of Yueqing People's Hospital Affiliated to Wenzhou Medical University (approval No.: YQYY202100080). The purpose and method of the study were introduced in detail before the start of the study, and informed consent was obtained from patients. All procedures were conducted in accordance with the Declaration of Helsinki.

Nurses who had been exposed to cancers for 5 years or more collected the baseline data from patients at admission and assessed the psychiatric complications after 3-month treatment, in order to discover and manage the mental health problems during the treatment and nursing in patients with pancreatic cancer.

Data Collection

Psychiatric complications, including major depressive disorder, dysthymic disorder, generalized anxiety disorder, and post-traumatic stress disorder, were assessed by nurses using the structured clinical interview (SCID-I) based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [15] during hospitalization (baseline) and 3 months after the start of treatment. Before the study started, all nurses had been trained first and assessed by one professional psychologist. Nurses who failed to pass the assessment had been excluded from the study, and three nurses were included in this study to perform the SCID prior to the start of the study.

Demographic and biomedical factors were obtained from patient records and interviews. Age, gender, education level, individual's monthly income, marital status, complications, psychiatric history, chronic disease, such as diabetes, hypertention, hyperlipidemia and other diseases which previously diagnosed by doctors, smoking history, drinking history, major life changes (except can-

cer diagnosis) were collected. Tumor stage, tumor location (pancreatic head, body or tail) and treatment methods (surgery alone, surgery + radiotherapy/chemotherapy, radiotherapy/chemotherapy alone) were also recorded.

The M.D. Anderson Symptom Inventory (MDASI) was developed by the University of Texas M.D. Anderson Cancer Center. The MDASI in Chinese version was a self-rated questionnaire, which contained six functional interference items and the following 13 symptom severity scale items, i.e., pain, fatigue, nausea, shortness of breath, distress, sleep disturbance, inappetence, memory difficulties, drowsiness, dry mouth, vomiting, sadness and numbness (tingling). Each item was scored on a numerical scale from 0 to 10, with higher scores indicating more severe symptoms. The scale was tested to be reliable and valid [16]. Cronbach alpha coefficient was 0.914 and the content validity index (I-CVI) was 0.833 in this study.

Statistical Methods

SPSS 25.0 statistical software (IBM Corp., Armonk, NY, USA) was used to analyze the data. The measurement data, such as age and MIDASI score, were expressed as mean ± standard deviation (SD) ($\bar{x} \pm s$). Shapiro-Wilk method was used to test the normal distribution. For measurement data that follow normal distribution, *t* test was adopted, while for measurement data that don't follow normal distribution, nonparametric test was used to compare the difference. The categorical data, such as gender, education level, average monthly income as the monthly family income per capita, marital status, complications, psychiatric history, smoking history, drinking history, major life changes, tumor stage, tumor location, and treatment methods were expressed by n (%), and analyzed using either the chi-square test (when the sample size was ≥40 and the theoretical frequency T was ≥5) or Fisher's exact probability test (when the sample size was <40 or the theoretical frequency T was <1) or the correction formula of the chi-square test (when the sample size was <40 or 1 ≤ the theoretical frequency T <5). Then the binary logistic regression analysis was used to find the predictors, with the presence or absence of psychiatric complications as the dependent variable, and the indicators with statistically significant differences in single factors as the independent variable. The type-I error rate was set as 0.05, and the difference was defined as statistically significant when $p < 0.05$.

Results

Incidence of Psychiatric Complications in Patients with Pancreatic Cancer

Among 80 patients evaluated at baseline and follow-up, 8 patients (10.00%) and 12 patients (15.00%) were diagnosed with psychiatric complications ($p = 0.339$), respectively. See Table 1 for details.

Univariate Analysis of Psychiatric Complications in Patients with Pancreatic Cancer

The eight patients with psychiatric complications at baseline were excluded during the further analysis. The occurrence group included the eight patients who were diagnosed with new-onset psychiatric complications at the follow-up. The remaining 64 patients without new-onset psychiatric complication were included in the non-occurrence group. Statistical difference existed in the gender (male, 100% vs 53.13%, $p = 0.031$), monthly family income per capita (<¥3000, 100% vs 50%, $p = 0.021$) and MDASI score of sadness at baseline (6.45 ± 1.52 vs 4.90 ± 1.40, $p = 0.005$) (The exchange rate is 1 USD = 6.48 CNY.) between the occurrence group and non-occurrence group (Table 2).

Multivariate Analysis of Predictors of Psychiatric Complications in Patients with Pancreatic Cancer

Binary logistic regression analysis found that gender as male (Odds Ratio (OR) = 1.674, $p = 0.019$), monthly family income per capita less than ¥3000 (OR = 1.735, $p = 0.023$), and high score of sadness (MDASI) at baseline (OR = 1.804, $p = 0.001$) were all predictors for psychiatric complications in patients with pancreatic cancer, as shown in Table 3.

Discussion

Among diversified malignant tumors, pancreatic cancer is clinically considered to be the disease with the highest depression risk [17,18]. According to relevant studies [19–21], the prevalence of depression and anxiety in 10% of patients with pancreatic cancer is 76%, but few studies adopt reliable diagnostic tools. According to relevant reports [22–24], anxiety and depression often appear before somatic symptoms in patients with pancreatic cancer, and psychiatric symptoms are the initial symptoms in 50% of patients with pancreatic cancer [25]. Therefore, some researchers have speculated that anxiety and depression in

Table 1. Incidence of psychiatric complications in patients with pancreatic cancer [n (%)].

Psychiatric complications	Baseline (n = 80)	3 months after the start of treatment (n = 80)
Major depressive disorder	3 (3.75)	4 (5.00)
Dysthymic disorder	2 (2.50)	3 (3.75)
Generalized anxiety disorder	2 (2.50)	3 (3.75)
Post-traumatic stress disorder	1 (1.25)	2 (2.50)

such patients may be related to acid-base system or neuroendocrine changes caused by tumors.

The psychiatric complications in cancer patients transform the status of physical, social and life functions, aggravate the conditions of patients, and even shorten their lifetime [26]. An overseas study has found that in patients with pancreatic cancer, the incidence of depression is as high as 71%, far higher than that of patients with gastric cancer, colon cancer and other malignant tumors [27]. The present study found that, among 72 patients without any psychiatric complications at baseline, 8 patients (11.11%) had new-onset psychiatric complications (4 cases with major depression disorder, 2 cases with dysthymic disorder, 1 case with generalized anxiety disorder, and 1 case with post-traumatic stress disorder) during a follow-up of relatively short 3 month. The study by Wang X *et al*. [28] has found that the prevalence of depression in cancer patients is 19.0%–73.9%, and the study by Chabowski M *et al*. [29] and Polański J *et al*. [30] has found that the prevalence of anxiety in cancer patients was 34.0%–65.0%. The prevalence of psychiatric complications varies among patients with different cancers, and the differences may be due to multiple types of cancer and assessment tools.

This study analyzed the predictors of psychiatric complications in patients with pancreatic cancer, and the results showed that gender as male (OR = 1.674, p = 0.019), average monthly income less than ¥3000 (OR = 1.735, p = 0.023), and high score of sadness (MDASI) at baseline (OR = 1.804, p = 0.001) were all predictors for psychiatric complications in patients with pancreatic cancer.

Although a study has proven that female patients are prone to anxiety and depression, compared with male patients [31]. Ernst *et al*. [32] reported that male cancer patients became depressed following diagnosis, disease or treatment, while diagnoses of depression in female patients seem unrelated to cancer. As in our study, we excluded patients with psychiatric complications before and found that male patients are prone to get psychiatric complications, other than anxiety and depression, after diagnosis of pancreatic cancer. Men, belonging to the backbone of the family, need to bear heavy family responsibility, and their abilities were inadequate affected by the disease. Furthermore, they do not like to express their feelings to others, which ultimately leads to psychiatric complications.

Pancreatic cancer patients with low monthly income are affected by the heavy economic burden of the disease, which will affect their sleep quality, induce negative emotions and cause psychiatric complications. Su LJ *et al*. [33] also found that lower income was related to a higher chance for poorer health-related quality of life among patients with ovarian, thyroid, cervical, lung, breast, colon, or prostate cancer. Moreover, Bradley CJ *et al*. [34] reported that cancer caregivers with low household income were more likely to get decreased income increased household debt, and stopping work, all of which would accelerate the mental burden.

The MDASI help assess the common clinical symptoms related to tumors and among all these symptoms, we first reported that the sadness score at baseline can be a predictor of newly onset psychiatric complications in patients with pancreatic cancer. Desiree Jones *et al*. [35] found that the sadness score can be a useful initial screen for depressed mood with modest sensitivity and high negative predictive value. Therefore, the sadness score is important for the management of patients with cancer, especially when pancreatic cancer patients with long-standing sadness, emotional and mental fluctuations in the short term and continued strong stimulation are prone to psychiatric complications.

Bettison TM *et al*. [36] has found that age is also an important predictor of psychiatric complications in patients with pancreatic cancer. Smoking and drinking are potential factors since they both represent as important parts in the lifestyle score, which is related to the mental health as reported. In addition, education [37], marital status [38], tumor stage [39], and treatment method [40] are all reported factors that have impacts on mental health of general population or patients with cancers. However, there are few studies focused on the predictors of psychiatric complications. Therefore, in our study, no significant difference is found in these factors, probably because our study, with relatively small sample size, focused on patient with pancreatic cancer and excluded patients with current psychiatric complications.

Table 2. Univariate analysis of psychiatric complications in patients with pancreatic cancer.

Projects	n	Occurrence group (n = 8)	Non-occurrence group (n = 64)	t/χ^2	p
Age (years old)		58.10 ± 5.40	57.96 ± 5.28	$t = 0.071$	0.944
Gender				$\chi^2 = 4.645$	0.031**
Male	42	8 (100.00)	34 (53.13)		
Female	30	0 (0.00)	30 (46.88)		
Education level				$\chi^2 = 0.698$	0.705
Junior high school and below	24	2 (25.00)	22 (34.38)		
Senior high school	35	5 (62.50)	30 (46.88)		
College degree or above	13	1 (12.50)	12 (18.75)		
Monthly family income per capita (CNY)				$\chi^2 = 5.317$	0.021**
<¥3000	40	8 (100.00)	32 (50.00)		
≥¥3000	32	0 (0.00)	32 (50.00)		
Marital status				$\chi^2 = 0.086$	0.958
Unmarried	7	1 (12.50)	6 (9.38)		
Married	55	6 (75.00)	49 (76.56)		
Divorced or widowed	10	1 (12.50)	9 (14.06)		
Complications				$\chi^2 = 0.205$	0.520*
Yes	6	1 (12.50)	5 (7.81)		
No	66	7 (87.50)	59 (92.19)		
Psychiatric history				$\chi^2 = 0.257$	1.000*
Yes	2	0 (0.00)	2 (3.13)		
No	70	8 (100.00)	62 (96.87)		
Smoking history				$\chi^2 = 0.035$	0.816**
Yes	20	2 (25.00)	18 (28.13)		
No	52	6 (75.00)	46 (71.87)		
Drinking history				$\chi^2 = 0.791$	0.578*
Yes	7	1 (12.50)	6 (9.38)		
No	65	7 (87.50)	58 (90.62)		
Major life changes				$\chi^2 = 0.257$	1.000*
Yes	2	0 (0.00)	2 (3.13)		
No	70	8 (100.00)	62 (96.87)		
Tumor stage				$\chi^2 = 0.064$	0.899**
I–II	42	5 (62.50)	37 (57.81)		
III–IV	30	3 (37.50)	27 (42.19)		
Tumor location				$\chi^2 = 0.002$	0.964**
Head of pancreas	50	5 (62.50)	45 (70.31)		
Body and tail of pancreas	22	3 (37.50)	19 (29.69)		
Treatment methods				$\chi^2 = 0.284$	0.868
Surgery	41	4 (50.00)	37 (57.81)		
Surgery + radiotherapy/chemotherapy	25	3 (37.50)	22 (34.38)		
Radiotherapy/chemotherapy	6	1 (12.50)	5 (7.81)		
Chronic disease[#]				$\chi^2 = 0.009$	0.741**
Yes	53	6 (75.00)	47 (26.56)		
No	19	2 (25.00)	17 (73.44)		
MDASI score at baseline					
Pain		4.68 ± 0.86	4.50 ± 0.82	$t = 0.583$	0.562
Fatigue		4.52 ± 0.90	4.41 ± 0.88	$t = 0.333$	0.740
Nausea		4.78 ± 0.85	4.64 ± 0.78	$t = 0.474$	0.637
Shortness of breath		4.80 ± 0.81	4.75 ± 0.85	$t = 0.158$	0.875
Distress		5.02 ± 0.95	4.95 ± 0.86	$t = 0.215$	0.831
Sleep disturbance		5.10 ± 0.75	4.98 ± 0.72	$t = 0.443$	0.659
Inappetence		4.86 ± 0.82	4.90 ± 0.80	$t = 0.133$	0.895
Memory difficulty		4.97 ± 0.76	4.92 ± 0.79	$t = 0.169$	0.866
Drowsiness		4.95 ± 0.88	4.88 ± 0.85	$t = 0.219$	0.827
Dry mouth		5.06 ± 0.85	5.12 ± 0.82	$t = 0.194$	0.846
Vomiting		4.84 ± 0.76	4.90 ± 0.80	$t = 0.201$	0.841
Sadness		6.45 ± 1.52	4.90 ± 1.40	$t = 2.926$	0.005
Numbness (tingling)		4.42 ± 0.69	4.38 ± 0.65	$t = 0.163$	0.871

Note: #Chronic disease includes diabetes, hypertention, hyperlipidemia and other diseases which previously diagnosed by doctors. *Fisher's chi-square test was used; **The correction formula of the chi-square test was used. MDASI, M.D. Anderson Symptom Inventory. The exchange rate is 1 USD = 6.48 CNY.

Given that the incidence of psychiatric complications in patients with pancreatic cancer is comparable to that of other cancers, one strategy is early detection through repeated routine screening [41–43]. Another strategy is to combine the various predictors that have been identified, such as multidimensional preventive interventions for pan-

Table 3. Multivariate analysis of psychiatric complications in patients with pancreatic cancer.

Factors	*B* value	SE	*p*	Wald value	OR value	95% CI
Gender (Male)	0.515	0.220	0.019	5.480	1.674	1.087–2.572
Monthly family income per capita (<¥3000)	0.551	0.244	0.023	5.099	1.735	1.076–2.798
Higher score of Sadness (MDASI) at baseline	0.590	0.201	0.001	8.616	1.804	1.216–2.676

Note: OR, Odds Ratio; CI, Confidence Interval; SE, Standard Error.

creatic cancer patients with male gender, lower monthly income and higher sadness score in the MDASI. Due to the poor prognosis of pancreatic cancer patients, it is necessary to strengthen mental health intervention [44,45].

However, there are still some limitations in this article. For instance, the sample size included in this study is small, especially the small number of cases with psychiatric complications. All cases are from the same hospital, which may bias the final results. We primarily focused on the general demographic characteristics and clinical indicators of the patients. It was possible that some indicators, especially those related to social and psychological aspects, were not covered. Subsequent studies are needed to further demonstrate the above conclusions and guide clinical practice.

Conclusions

The predictors of psychiatric complications in patients with pancreatic cancer include gender, monthly income and sadness in MDASI score. The clinical attention should be paid to pancreatic cancer patients with male gender, lower monthly income and higher sadness score in MDASI, and effective measures such as rational psychological interventions need to be actively taken to reduce the complications.

Availability of Data and Materials

The original contributions presented in the study are included in the article. Further inquiries can be directed to the corresponding author.

Author Contributions

LL: Conception, Design, Supervision, Materials, Data Collection, Analysis, Literature Review, Writing. SC: Design, Supervision, Materials, Data Collection, Analysis, Writing, Critical Review. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study has been approved by the ethics committee of Yueqing People's Hospital Affiliated to Wenzhou Medical University (approval No.: YQYY202100080). Before the start of the study are introduced in detail the research purpose of this study and methods, the study patients were informed consent.

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Conflict of Interest

The authors declare no conflict of interest.

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