

Article

Risk factors of anxiety and depression in patients undergoing surgery for thyroid cancer

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Abstract: Background: Postoperative patients with thyroid cancer are prone to anxiety and depression, which will have adverse effects on their postoperative recovery and quality of life. **Objective:** To explore the status of postoperative anxiety and depression in patients with thyroid cancer, and analyze the related influencing factors and their relationship with quality of life. **Methods:** This study employed a convenient sampling method to enroll 152 patients undergoing thyroid cancer surgery. During the first postoperative follow-up, a comprehensive assessment was conducted using standardized instruments: Demographic information questionnaire, self-rating anxiety scale (SAS), self-rating depression scale (SDS), and the quality of life core questionnaire (EORTC QLQ-C30) developed by the European Organization for Research and Treatment of Cancer. Binary logistic regression was used to analyze the risk factors, and Spearman correlation analysis was used to analyze the relationship between anxiety, depression and quality of life. **Results:** Among 152 patients, the incidence of anxiety was 41.4%, and the incidence of depression was 36.2%. Binary Logistics analysis showed that gender (OR = 4.453, 95%CI: 1.186–16.711), occupational status (OR = 0.394, 95%CI: 1.152–3.428), family monthly income (OR = 0.567, 95%CI: 0.245–0.816), risk of recurrence (OR = 2.333, 95%CI: 1.922–5.902), vocal hoarseness (OR = 3.533, 95%CI: 1.429–8.734) were independent risk factors for anxiety in postoperative patients with thyroid cancer. The risk of recurrence (OR = 1.437, 95%CI: 1.136–3.825) and vocal hoarseness (OR = 6.465, 95%CI: 2.432–17.185) are independent risk factors for depression in patients with thyroid cancer after surgery. The anxiety and depression scores of postoperative patients with thyroid cancer were significantly negatively correlated with general health status and five functional domains (physical function, role function, emotional function, cognitive function and social function), and significantly positively correlated with six separate items (shortness of breath, insomnia, loss of appetite, financial difficulties) and three symptom domains (fatigue, nausea and vomiting, pain). In the functional domain dimension, the correlation between emotional function and anxiety and depression was the most significant ($r = -0.589$, $r = -0.551$). In the dimension of symptoms, fatigue had the highest correlation with anxiety and depression ($r = 0.732$, $r = 0.908$). At the single item level, pain had the highest correlation with anxiety and depression ($r = 0.484$, $r = 0.427$). **Conclusion:** The anxiety and depression of patients with thyroid cancer surgery are related to female, occupational status, family monthly income, risk of disease recurrence and hoarseness, and these negative emotions have a significant adverse impact on the quality of life.

Keywords: Thyroid cancer; anxiety; depression; risk factors; quality of life

1. Introduction

Thyroid cancer is the most common malignancy of the endocrine system, accounting for about 1% of all malignancies [1]. In recent years, the incidence of thyroid cancer has increased sharply in China, and the incidence of women is three

times that of men, and it has become the most common cancer in women under 30 years old in China [2,3]. Globally, overdiagnosis of thyroid cancer has become a significant public health issue worldwide. Studies have found that overdiagnosis is more prevalent in women than in men, with over 85% of thyroid cancer cases among Chinese women attributed to overdiagnosis [4]. This phenomenon may be driven by screening effects resulting from the widespread use of ultrasound, as the recent increase in various neck imaging techniques has substantially elevated the detection rate of papillary thyroid microcarcinoma (PTMC), necessitating effective management strategies to prevent overtreatment. The American Thyroid Association (ATA) guidelines recommend prioritizing active surveillance over immediate surgery for low-risk PTMC [5]. Nevertheless, surgery remains the standard therapeutic approach for symptomatic tumors (e.g., airway compression) or those with radiographic progression (e.g., annual tumor volume increases exceeding 3 mm).

Thyroid cancer usually has a low degree of malignancy, and most patients can obtain a good prognosis after receiving surgical treatment. Benefit from the progress of medicine, the 5-year survival rate of thyroid cancer in China has been increased to 84.3% [6]. Nonetheless, patients often experience psychological problems such as anxiety or depression during treatment [7]. According to relevant studies, about 30% to 50% of patients undergoing thyroid cancer surgery experience anxiety symptoms to varying degrees, and the incidence of depression is as high as 20% to 40% [3,8]. As a stressor, anxiety or depressive mood can trigger a series of physiological changes, adversely affecting the successful execution of surgery, postoperative recovery, pain management, and sleep quality [9]. It can also affect the cellular immune function of patients through the neuro-endocrine-immune mechanism, thereby reducing the effect of surgical treatment and affecting the postoperative recovery of patients [10,11].

In contemporary clinical practice, mental health care for cancer patients remains a persistently overlooked aspect of comprehensive cancer care. Current treatment protocols frequently fail to integrate standardized psychological support systems, with this deficiency becoming particularly acute during surgical procedures. Preoperative anxiety and postoperative psychological distress often persist unaddressed due to insufficient access to professional counseling services, despite clear evidence that untreated mental health conditions can significantly impair recovery outcomes. While clinical guidelines emphasize holistic patient assessment, many practitioners have a systematically biased perception of cancer-related psychiatric comorbidities, often focusing on physiological indicators over psychological assessments. Although studies have shown that anxiety and depression not only prolong the hospitalization time of patients, but also may increase the incidence of complications and affect the quality and efficiency of postoperative rehabilitation [12,13]. But this neglect still exists.

Therefore, paying attention to the mental health status of patients with thyroid cancer surgery is of great significance for improving the prognosis and overall quality of life. At present, the potential risk factors of anxiety and depression in patients with thyroid cancer surgery need to be further studied.

This study aims to establish a ‘biopsychosocial collaborative management model’ by systematically evaluating the epidemiological characteristics and modifiable risk factors of anxiety and depression in patients after thyroid cancer surgery, thereby

providing multidimensional evidence to optimize perioperative decision-making and improve long-term quality of life.

2. Study subjects and methods

2.1. Study design and participants

This study was a cross-sectional survey. A total of 152 patients who underwent thyroid cancer surgery in Nanjing First Hospital from July 2021 to June 2024 were selected by convenient sampling method (**Figure 1**). This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was reviewed by the Ethics Committee of Nanjing First Hospital (KY20250224-KS-02).

Inclusion criteria: (I) Postoperative patients with thyroid cancer confirmed by postoperative pathological diagnosis; (II) age ≥ 18 years old; (III) having clinical indications for surgical treatment and successfully completing surgical treatment; (IV) clear consciousness, normal comprehension, normal hearing and language expression; (V) Informed consent to participate in this study.

Exclusion criteria: (I) patients with a history of anxiety, depression or organic mental illness; (II) patients with a history of substance abuse or alcoholism; (III) combined with cardiovascular and cerebrovascular diseases, liver failure; (IV) patients with hearing and language dysfunction; (V) patients with other malignant tumors in the past or the same period.

In the study of variables influencing factors, the sample size should be at least 5-10 times the number of variables. There were 14 variables in this study; therefore, the required sample size ranged from 70 to 140 cases, finally, a total of 152 patients were included in this study.

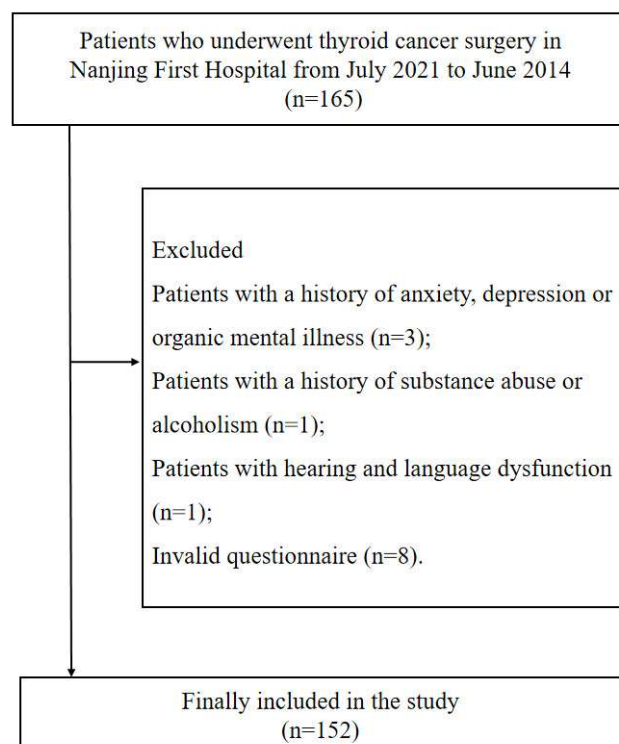


Figure 1. Patient screening flow chart.

2.2. Research tools

2.2.1. Demographic information questionnaire

Demographic data including age, gender, occupational status, marital status, residence, medical insurance type, education level, and family per capita monthly income were collected. Clinical data included surgical procedure, tumor pathological type, recurrence risk, TSH control level, medication compliance, and postoperative complications.

2.2.2. Self-rating anxiety scale and self-rating depression scale

Self-rating Anxiety Scale (SAS) and self-rating depression scale (SDS) were used to evaluate the anxiety and depression status of patients [14]. Both the SAS and SDS contained 20 items, and the scores from each item were summed to obtain a rough total score. To improve the comparability and standardization of scoring results, the standard score was obtained by multiplying the crude total score by 1.25 and rounding it up. According to the general standard of our country, SAS standard score ≥ 50 points can be judged as anxiety, 50–59 points as mild anxiety, 60–69 points as moderate anxiety, more than 70 points as severe anxiety. The SAS has been shown to have good internal consistency with a Cronbach's α coefficient of 0.82. SDS score ≥ 53 points is defined as depression, of which 53–60 points were classified as mild depression, 61–70 points were classified as moderate depression, and more than 70 points were classified as severe depression. The SDS has been shown to have good internal consistency with a Cronbach's α coefficient of 0.79.

2.2.3. European organization for research and treatment of cancer quality of life core questionnaire (EORTC QLQ-C30)

EORTC QLQ-C30 [15] is widely used in the study of the quality of life of patients with malignant tumors. The scale includes five functional dimensions: physical function, role function, cognitive function, emotional function, and social function. Three symptom dimensions: fatigue, pain, nausea and vomiting; Six single items: shortness of breath, insomnia, loss of appetite, constipation, diarrhea, and financial difficulties; An overall health score, a total of 30 items. Item 29 and item 30 were divided into 7 grades and scored from 1 to 7 according to the choice. Other items were scored on a 4-point scale ranging from 1 to 4. All scales are scored on a 0–100 metric. Higher scores in functional domains and global health status indicate better quality of life, whereas higher scores in symptom domains reflect poorer quality of life.

2.2.4. Data collection method

During the first postoperative follow-up (typically within 4 weeks after discharge), after the attending surgeon completed the clinical assessment, the researchers explained the purpose, content, and privacy protection measures of the study to participants using a standardized protocol. Following informed consent, trained research assistants conducted one-on-one interviews and guided the patients in completing the survey questionnaire. After filling out, the integrity of the questionnaire was reviewed in time. If there were missing items in the questionnaire, the patients should be informed immediately for supplement. After confirming that all items are filled in correctly, the questionnaire can be formally returned. If participants were unable to independently complete questionnaires due to cognitive impairment or

limited mobility, assistance was permitted from immediate family members (after signing an authorization form for proxy completion) or trained research assistants. To ensure data integrity, research assistants were strictly prohibited from offering interpretive guidance or suggesting responses beyond reading the questions verbatim.

In this study, a total of 160 questionnaires were distributed and 160 were recovered on the spot, with an effective recovery rate of 100%. Among them, 152 were valid questionnaires, and the effective rate of the questionnaire was 95%.

2.4.5. Statistical analysis

SPSS26.0 was used to analyze the data, and the count data were expressed as rate or percentage, and the chi-square test was used for comparison between groups. Measurement data were expressed as (mean $\pm$ SD), and analysis of variance was used for comparison between groups. The risk factors of postoperative anxiety and depression were analyzed by binary Logistic regression. Spearman correlation analysis was used to analyze the correlation between anxiety, depression and quality of life.

3. Results

3.1. Single factor analysis of influencing factors of postoperative anxiety and depression in patients with thyroid cancer

Univariate analysis showed that there were statistically significant differences in gender, marital status, occupational status, family monthly income per capita, type of medical insurance, risk of disease recurrence, and TSH control level between anxiety patients and non-anxiety patients ($P < 0.05$). There were significant differences in occupational status, family income per capita, risk of disease recurrence, and TSH control level between depressed patients and non-depressed patients ($P < 0.05$) (Table 1).

Table 1. Univariate analysis of influencing factors of postoperative anxiety and depression in patients with thyroid cancer.

Item	Group	Anxiety ($n = 63$) (%)	Non-anxiety ($n = 89$) (%)	χ^2	P	Depression ($n = 55$) (%)	Non-depression ($n = 97$) (%)	χ^2	P
Gender	Male	5 (7.9)	23 (25.8)	7.87	0.005	7 (12.7)	21 (21.6)	1.859	0.173
	Female	58 (92.1)	66 (74.2)			48 (87.3)	76 (78.4)		
Age (years)	<40	15 (23.8)	20 (22.5)	0.037	0.847	17 (30.9)	18 (18.6)	3.022	0.082
	≥ 40	48 (76.2)	69 (77.5)			38 (69.1)	79 (81.4)		
Education background	High school and below	33 (52.4)	36 (40.4)	2.119	0.145	26 (47.3)	43 (44.3)	0.123	0.726
	Junior college or above	30 (47.6)	53 (59.6)			29 (52.7)	54 (55.7)		
Status of occupation	On the job	50 (79.4)	56 (62.9)	4.726	0.030	45 (81.8)	61 (62.9)	16.252	0.000
	Not on the job	13 (20.6)	33 (37.1)			10 (18.2)	36 (37.1)		
Monthly household income (Yuan)	≤ 5000	45 (71.4)	35 (39.3)	15.242	0.000	38 (69.1)	42 (43.3)	9.365	0.002
	>5000	18 (28.6)	54 (60.7)			17 (30.9)	55 (56.7)		

Table 1. (Continued).

Item	Group	Anxiety (<i>n</i> = 63) (%)	Non-anxiety (<i>n</i> = 89) (%)	χ^2	<i>P</i>	Depression (<i>n</i> = 55) (%)	Non-depression (<i>n</i> = 97) (%)	χ^2	<i>P</i>
Operation method	Full cut	22 (34.9)	35 (39.3)	0.305	0.581	16 (29.1)	41 (42.3)	2.6	0.107
	Not full cut	41 (65.1)	54 (60.7)			39 (70.9)	56 (57.7)		
Risk of recurrence	low-risk	19 (30.2)	65 (73.0)	27.428	0.000	14 (25.4)	70 (72.2)	30.975	0.000
	Middle-risk/High-risk	44 (69.8)	24 (27.0)			41 (74.6)	27 (27.8)		
TSH control level	Worse	4 (6.3)	1 (1.1)	20.251	0.000	3 (5.5)	2 (2.1)	49.328	0.000
	General	30 (47.6)	16 (18.0)			35 (63.6)	11 (11.3)		
	Good	29 (46.1)	72 (80.9)			17 (30.9)	84 (86.6)		
Medication compliance	Take regularly	59 (93.7)	80 (89.9)	0.298	0.585	47 (85.5)	92 (94.8)	3.958	0.047
	Omission to take	4 (6.3)	9 (10.1)			8 (14.5)	5 (5.2)		
Pathological type	Papillary carcinoma	53 (84.1)	82 (92.1)	2.636	0.268	49 (89.1)	86 (88.6)	0.496	0.780
	Follicular carcinomas	7 (11.1)	6 (6.8)			4 (7.3)	9 (9.3)		
	Medullary carcinoma	3 (4.8)	1 (1.1)			2 (3.6)	2 (2.1)		

3.2. The incidence of postoperative adverse symptoms was compared

There were 47 patients with dysphagia after operation, including 28 cases of anxiety ($P < 0.05$) and 21 cases of depression ($P > 0.05$). Hoarseness occurred in 53 patients, including 37 patients with anxiety and 35 patients with depression ($P < 0.05$) (Table 2).

Table 2. The incidence of postoperative adverse symptoms was compared.

Symptom	Anxiety (<i>n</i> = 63)	Non-anxiety (<i>n</i> = 89)	<i>P</i>	Depression (<i>n</i> = 55)	Non-depression (<i>n</i> = 97)	<i>P</i>
Dysphagia			0.002			0.145
Yes	28	19		21	26	
No	35	70		34	71	
Vocal hoarseness			0.000			0.000
Yes	37	16		35	18	
No	26	63		20	79	
Tetany			0.052			0.351
Yes	19	15		10	24	
No	44	74		45	73	
Shoulder stiffness			0.091			0.762
Yes	22	20		16	26	
No	41	69		39	71	

3.3. Binary logistics regression analysis of influencing factors of anxiety and depression in patients with thyroid cancer

Regression analysis showed that gender (OR = 4.453, 95%CI: 1.186–16.711),

occupational status (OR = 0.394, 95%CI: 1.152–3.428), family monthly income (OR = 0.567, 95%CI: 0.245–0.816), risk of recurrence (OR = 2.333, 95%CI: 1.922–5.902), vocal hoarseness (OR = 3.533, 95%CI: 1.429–8.734) were risk factors for anxiety in patients with thyroid cancer after surgery (**Table 3**). The risk of recurrence (OR = 1.437, 95%CI: 1.136–3.825) and vocal hoarseness (OR = 6.465, 95%CI: 2.432–17.185) were risk factors for depression in patients with thyroid cancer after surgery (**Table 4**).

Table 3. Binary logistics regression analysis of influencing factors of anxiety in patients with thyroid cancer.

Variable	B	S. E	Wald	P	OR	95%CI
Gender	1.494	0.675	4.899	0.027	4.453	1.186–16.711
Status of occupation	−0.931	0.486	3.661	0.05	0.394	1.152–3.428
Monthly household income	−0.567	0.429	1.747	0.031	0.567	0.245–0.816
Risk of recurrence	1.541	0.474	10.569	0.045	2.333	1.922–5.902
TSH control level	0.087	1.578	0.003	0.956	1.091	0.050–24.051
Dysphagia	0.212	0.512	0.171	0.679	1.236	0.453–3.369
Vocal hoarseness	1.262	0.462	7.472	0.006	3.533	1.429–8.734

S.E, Standard Error; OR, odds ratio; CI, confidence interval.

Table 4. Binary logistics regression analysis of influencing factors of depression in patients with thyroid cancer.

Variable	B	S. E	Wald	P	OR	95%CI
Status of occupation	−0.438	0.502	0.759	0.384	0.646	0.241–1.728
Monthly household income	−0.192	0.491	0.153	0.695	0.212	0.463–2.178
Risk of recurrence	0.880	0.469	3.521	0.036	1.437	1.136–3.825
TSH control level	−1.653	1.395	1.403	0.236	0.192	0.012–2.951
Vocal hoarseness	1.866	0.499	13.999	0.000	6.465	2.432–17.185

S.E, Standard Error; OR, odds ratio; CI, confidence interval.

3.4. Patients with different anxiety, depression and quality of life status

The overall quality of life, each functional field, symptom field and single item scores of postoperative patients with thyroid cancer were investigated, as well as the status quo of different anxiety, depression and quality of life of patients (**Table 5**).

Table 5. Patients with different anxiety, depression and quality of life status.

Dimensionality	Overall average score	Average score of anxiety	Average score of non-anxiety	Average score of depression	Average score of non-depression
General health status	70.85 ± 9.44	65.85 ± 6.19	74.38 ± 4.65	64.36 ± 5.92	77.62 ± 5.08
Physical function	81.24 ± 10.62	76.37 ± 6.22	85.39 ± 5.52	75.14 ± 6.25	84.69 ± 5.74
Role functions	78.51 ± 9.23	74.10 ± 7.45	81.67 ± 6.39	72.93 ± 8.34	81.71 ± 9.86
Emotional function	72.69 ± 8.18	67.05 ± 5.83	76.46 ± 5.14	67.94 ± 5.60	78.35 ± 5.26
Cognitive function	77.36 ± 10.40	68.84 ± 7.33	83.39 ± 6.24	71.22 ± 8.36	80.84 ± 5.43
Social function	74.11 ± 9.53	67.62 ± 7.09	78.71 ± 5.56	68.25 ± 7.47	77.34 ± 5.21
Tired out	40.55 ± 7.27	42.39 ± 4.67	36.42 ± 4.33	48.38 ± 5.01	38.12 ± 4.62

Table 5. (Continued).

Dimensionality	Overall average score	Average score of anxiety	Average score of non-anxiety	Average score of depression	Average score of non-depression
Nausea and vomiting	2.84 ± 3.52	4.10 ± 2.26	1.96 ± 1.57	4.54 ± 2.12	1.88 ± 1.53
Pain	22.67 ± 5.31	30.58 ± 2.72	15.94 ± 2.15	29.73 ± 3.36	17.64 ± 2.09
Dyspnea	14.35 ± 6.29	21.42 ± 3.54	9.35 ± 2.48	23.86 ± 3.20	8.96 ± 2.57
Insomnia	31.62 ± 5.42	40.06 ± 3.81	25.64 ± 3.33	43.15 ± 4.12	25.08 ± 2.94
Loss of appetite	13.48 ± 4.37	20.14 ± 2.65	8.76 ± 1.24	22.62 ± 3.43	8.30 ± 1.58
Constipation	7.56 ± 5.04	12.46 ± 5.15	4.09 ± 2.56	11.78 ± 4.92	5.17 ± 2.66
Diarrhea	3.83 ± 2.18	5.23 ± 1.34	2.83 ± 1.01	5.27 ± 1.50	3.01 ± 1.12
Economic hardship	32.70 ± 15.36	40.00 ± 11.78	25.28 ± 8.65	43.13 ± 12.37	26.78 ± 7.90

3.5. Correlation analysis of patients' anxiety, depression and quality of life

The anxiety and depression scores of postoperative patients with thyroid cancer were negatively correlated with general health status and five functional domains (physical function, role function, emotional function, cognitive function and social function), and positively correlated with six separate items (shortness of breath, insomnia, loss of appetite, financial difficulties) and three symptom domains (fatigue, nausea and vomiting, pain). There was no correlation between constipation and diarrhea. In the functional domain dimension, the correlation between emotional function and anxiety and depression was the most significant ($r = -0.589$, $r = -0.551$). In the dimension of symptoms, fatigue had the highest correlation with anxiety and depression ($r = 0.732$, $r = 0.908$). At the single item level, pain had the highest correlation with anxiety and depression ($r = 0.484$, $r = 0.427$). See **Table 6**.

Table 6. Correlation analysis of patients' anxiety, depression and quality of life.

	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	17)
1) SAS	1																
2) SDS	0.427**	1															
General health status	-0.618*	-0.573**	1														
Physical function	-0.325*	-0.319**	0.351*	1													
Role functions	-0.374*	-0.402*	0.386*	0.427*	1												
Emotional function	-0.589*	-0.551**	0.513*	0.367*	0.552*	1											
Cognitive function	-0.503*	-0.516**	0.629*	0.285*	0.464*	0.515*	1										
Social function	-0.462*	0.434*	0.485*	0.372*	0.591*	0.643*	0.411*	1									
Tired out	0.732**	0.908*	-0.694**	-0.716*	-0.687**	-0.539*	-0.733**	-0.624**	1								
Nausea and vomiting	0.295**	0.376*	-0.118	-0.074	-0.093	-0.162	-0.057	-0.148	0.105	1							

Table 6. (Continued).

	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	17)
Dyspnea	0.336* *	0.319* *	-0.278 **	-0.254 **	-0.367 **	-0.185 **	-0.216 **	-0.242 **	0.389* *	0.251* *	0.304* *	1					
Insomnia	0.421* *	0.283* *	-0.755 **	-0.419 **	-0.385 **	-0.292 **	-0.473 *	-0.369 *	0.371* *	0.190* *	0.211* *	0.542* *	1				
Loss of appetite	0.267* *	0.314* *	-0.334 **	-0.243 **	-0.272 *	-0.306 *	-0.182 **	-0.075 *	0.244* *	0.408* *	0.093* *	0.367* *	0.425 *	1			
Constipation	0.114	0.085	-0.162	-0.097 *	-0.056	-0.047	-0.039	-0.051	0.082	0.034	0.128* *	0.022	0.096	0.05 5	1		
Diarrhea	0.095	0.067	-0.153	-0.110 *	-0.091	-0.038	-0.075	-0.122	0.053	0.046	0.152	0.238	0.363	0.11 1	0.29 4	1	
Economic hardship	0.382* *	0.365* *	-0.298 **	-0.226 **	-0.304 **	-0.517 **	-0.348 **	-0.373 **	0.263* *	0.184	0.105* *	0.311	0.274 *	0.16 8	0.15 6	0.0 41	1

SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale. * $p < 0.05$, ** $p < 0.01$.

4. Discussion

In this study, the incidence of anxiety and depression in postoperative patients with thyroid cancer was 41.4% (63/152) and 36.2% (55/152), respectively. The results showed that female, occupational status, family monthly income per capita, risk of disease recurrence, hoarseness were the risk factors of postoperative anxiety in patients with thyroid cancer. The risk of disease recurrence and hoarseness are risk factors for depression.

The role of gender differences in anxiety and depression cannot be ignored [16,17]. Cai et al. [18] study revealed that the level of depression in female patients was significantly higher than that in males. The results of this study show that female patients are more likely to suffer from anxiety and depression after surgery, which is consistent with previous studies showing that female thyroid cancer patients bear greater psychological stress [19]. Notably, the current increase in thyroid cancer cases among women stems primarily from their greater access to screening opportunities compared to men (e.g., clinical needs such as reproductive health management and perimenopausal follow-up, which contribute to elevated screening frequency) [4]; furthermore, this endocrine system disorder itself and its associated abnormal fluctuations in thyroid hormone levels can significantly impact patients' emotional states [10,20].

The results of this study showed that employed patients faced a higher risk of anxiety and depression compared with non-employed patients. This may be due to factors such as work stress, limited physical function after surgery, and impaired social interaction, which lead to greater social and emotional stress. In previous studies, family economic status was considered to be an important factor affecting patients' anxiety and depression [21,22]. In this study, family income was negatively correlated with the level of anxiety and depression, and the patients with monthly family income less than 5000 yuan had more serious anxiety and depression symptoms. For families with low income, the cost of thyroid cancer surgery may bring a heavy economic burden to the family, so patients are prone to have a sense of psychological burden. In addition, the risk of disease recurrence is also a risk factor for the occurrence of anxiety in postoperative patients with thyroid cancer, and previous studies have confirmed that the level of fear of cancer recurrence is closely related to depression and anxiety [23–

25]. Our results show that patients with a high risk of thyroid cancer recurrence show higher anxiety levels, which may stem from the concern that the disease may flare up again at any time. Therefore, patients are prone to psychological states such as nervousness, anxiety, or fear. If patients are immersed in fear and worry about cancer recurrence for a long time, it will have adverse effects on their physical functional status, postoperative recovery and quality of life [26].

Hoarseness is a common complication after thyroid cancer surgery, which not only affects the emotional state of patients, but may also increase the risk of anxiety and depression [2,27]. In the present study, the incidence of both anxiety and depression in patients with hoarseness exceeded 50%. Patients may face social barriers and changes in self-image due to postoperative voice changes, which further aggravates their psychological burden. In addition, some patients feel shame about the scar left by the surgery, which causes them to feel low self-esteem and embarrassment in social situations and may even choose to avoid social events. This self-limiting behavior further exacerbated their feelings of anxiety and depression.

Postoperative quality of life is one of the important indicators to evaluate the therapeutic effect of patients [28]. Patients with thyroid cancer face not only physical recovery but also psychological challenges after surgery. Studies have shown that postoperative quality of life is closely related to the psychological state of patients [29]. Therefore, it is of great significance to analyze the relationship between anxiety, depression and quality of life in patients with thyroid cancer after surgery. The results showed that there was a significant negative correlation between general health status and five functional domains (including physical function, role function, emotional function, cognitive function and social function) and anxiety and depression scores in postoperative patients with thyroid cancer. This is similar to the results of Yang and Xu's [30] study on the quality of life of patients after thyroid cancer surgery. In addition, the three symptom domains (fatigue, nausea and vomiting, pain) showed significant positive correlations with anxiety and depression scores. Six individual items (shortness of breath, insomnia, loss of appetite, and financial difficulties) also showed significant positive correlations with anxiety and depression scores. However, there was no correlation between constipation and diarrhea and anxiety and depression scores. In the functional domain dimension, emotional function was most significantly correlated with anxiety and depression. In the dimension of symptom domain, fatigue had the highest correlation with anxiety and depression. At the single item level, pain had the most prominent correlation with anxiety and depression.

The correlation between fatigue and anxiety and depression may be because the patients with thyroid cancer surgery are worried about the prognosis of the disease and potential complications, and then affect the quality of sleep. In addition, patients lack necessary daily activities due to physical reasons, resulting in slow physical recovery and resulting in fatigue symptoms. Yeni et al. [31] studies have shown that depression can affect the quality of life through sleep and fatigue. Mateja Rubic et al. [32] evaluated 150 patients and found that quality of life was affected by physical fatigue after thyroid hormone withdrawal and changes in sleep. This suggests that we should strengthen the popularization of disease knowledge for patients when they are discharged, and guide their exercise methods and precautions in the early postoperative period, so as to realize the scientific health education. Pain has the

highest correlation with anxiety and depression, which may be related to the fact that the surgical incision is still in the healing stage in the early stage after surgery. Local cutaneous nerve repair may cause needle-like pain, and pain leads to anxiety and depression of patients, and anxiety and depression will aggravate wound pain in turn. The effect of negative emotions on the quality of life of patients with thyroid cancer after surgery should not be underestimated. Therefore, it is clinically worthy of attention to effectively alleviate the negative emotions of patients with thyroid cancer and improve their quality of life.

Although the incidence of thyroid cancer has surged in recent years, its age-standardized mortality rate has remained stable or even declined over the past decades, confirming the existence of overdiagnosis. This phenomenon subject asymptomatic individuals classified as “cancer patients” to unnecessary psychological distress, including anxiety about disease progression, concerns over treatment side effects, and persistent fears regarding long-term health risks. Studies demonstrate that merely bearing the cancer label itself may significantly impair quality of life, even when no active treatment is ultimately administered [33]. While advancements in imaging technologies enable increased detection of indolent tumors, these improvements have not translated into survival benefits. Conversely, they may induce iatrogenic harm through overtreatment, such as lifelong hormone replacement following thyroidectomy and vocal cord injury risks. Consequently, clinical practice urgently requires risk stratification protocols and patient education initiatives to balance the benefits of early diagnosis against the risks of excessive intervention, while simultaneously addressing patients’ mental health needs.

This study was conducted in a single center, which has certain geographical limitations, poor representativeness, and small sample size. In addition, due to the limitation of manpower, material resources and time, only the patients who were reexamined one month after thyroid cancer surgery were investigated, and the patients were not investigated regularly for a long time. In the future study, we will further expand the study scale and follow up the patients for a long time.

5. Conclusion

The risk of disease recurrence and hoarseness are the risk factors of anxiety and depression in patients with thyroid cancer. Female, occupational status, and family per capita monthly income are the risk factors of anxiety. Anxiety and depression can affect the quality of life of patients with thyroid cancer after surgery. Therefore, in clinical practice, we should pay more attention to the psychological state of patients, identify the relevant influencing factors as soon as possible, and take intervention measures to reduce the risk of postoperative anxiety and depression.

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