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Analysis of the Preoperative Psychological Resilience Status and Influencing Factors of Patients Undergoing Thyroid Nodule Ablation

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Abstract: Objective To systematically investigate the psychological status and related influencing factors of patients with thyroid nodule ablation before operation. **Methods** A total of 182 patients with thyroid nodule who were hospitalized in the Department of Endocrinology of a third-class A hospital in Shandong Province from June to October 2022 and underwent thyroid nodule ablation were selected as the subjects of this study. General data questionnaire, Zung Self-rating Anxiety Scale, Zung Self-rating Depression Scale and Psychological Resilience Scale were used to investigate the preoperative psychological conditions of patients with thyroid nodule ablation. Univariate analysis and multi-factor stepby-step regression were used to analyze the influencing factors of preoperative psychological conditions of patients with thyroid nodule ablation. **Results** The scores of anxiety, depression and mental resilience were (38.24±6.66), (46.81±6.78) and (63.46±9.22) before thyroid nodule ablation. The results of multi-factor stepwise regression analysis showed that gender, working status, understanding degree of disease, anxiety and depression were all influencing factors of preoperative mental resilience of patients ($P < 0.05$). **Conclusions** Preoperative psychological status of patients undergoing thyroid nodule ablation is at a lower than medium level. In clinical work, preoperative health education and psychological counseling of patients undergoing thyroid nodule ablation should be emphasized, so as to improve their psychological resilience and promote their physical and psychological recovery after surgery.

Keywords: Thyroid Nodules; Psychological Resilience; Anxiety and Depression; Influencing Factors; Ablation.

1. Introduction

Thyroid nodule refers to a pathological condition caused by abnormal growth of thyroid cells. Thyroid nodule ablation surgery, as a minimally invasive procedure, has the advantages of safety and definite efficacy [1]. It can better preserve thyroid function and has been clinically proven to be a substitute for surgical treatment for thyroid nodules [2]. It is applicable to patients with benign thyroid nodules or recurrent thyroid cancer [3]. The 5-year follow-up results show that there are fewer complications after thyroid nodule ablation surgery, and the recurrence and metastasis rates are very low [4]. Studies have shown that compared with healthy individuals, patients with thyroid nodules are more likely to experience symptoms such as anxiety and depression [5]. 20% of patients with thyroid nodules had psychological distress before the surgery [4]. This study aims to explore the preoperative psychological status of patients undergoing thyroid nodule ablation, analyze the related influencing factors, and provide theoretical basis for clinical psychological intervention.

2. Objects and Methods

2.1. Subjects

By using the convenience sampling method, 182 patients with thyroid nodules who were hospitalized in the endocrinology department of a tertiary grade A hospital in Shandong Province and underwent thyroid nodule ablation surgery from June to October 2022 were selected as the research subjects of this study. Inclusion criteria: a. Age between 18 and 80 years old; b. Meeting the diagnostic criteria for thyroid nodules in the "Diagnosis and Treatment Guidelines for Thyroid Nodules and Differentiated Thyroid Cancer"; c. Having given informed consent for this study. Exclusion criteria: a. Those who had previously suffered from anxiety disorders or depression; b. Those with severe immune, endocrine or organic diseases of the heart and brain; c. Those with severe hearing or communication disorders.

2.2. Research Tools and Methods

2.2.1. Research Tools

2.2.1.1 General Information Questionnaire

The general information questionnaire was designed by the researchers themselves. It mainly includes three aspects: general demographic information (gender, age, body mass index, place of residence, marital status, educational level, work situation, family income, payment method for medical care, etc.), disease-related information (type of nodules, nature of nodules, number of nodules, size of nodules, location of nodules, disease duration, understanding of the disease and other disease conditions, etc.) and health-related behaviors (smoking, drinking, exercise, etc.).

2.2.1.2 Zung Self-Rating Depression Scale (SAS)

The Self-Rating Anxiety Scale was developed by William W. K. Zung in 1971 [8], consisting of 20 items, using Likert 4-point scoring, and is used to assess the anxiety level of adults. The total score can be obtained by adding up the scores of the 20 items. The higher the total score, the more obvious the tendency of depression. A score of 50-59 indicates mild

anxiety, 60-69 indicates moderate anxiety, and a score above 70 indicates severe anxiety. The Cronbach's α coefficient is 0.931, indicating good reliability and validity [9].

2.2.1.3 Zung Depression Self-Rating Scale (SDS)

The Depression Self-Rating Scale was developed by William W. K. Zung in 1965 [10], consisting of 20 items, using Likert 4-point scoring. It is used to assess the level of depression in adults. The total score is obtained by adding up the scores of the 20 items. The higher the total score, the more obvious the tendency of depression. Scores ranging from 53 to 62 indicate mild depression, 63 to 72 indicate moderate depression, and above 72 indicate severe depression. The Cronbach's α coefficient is 0.874, indicating good reliability and validity [9].

2.2.1.4 Psychological Resilience Scale (CD-RISC)

The Psychological Resilience Scale was developed by Connor and Davidson as a method for assessing resilience [11]. This scale consists of 25 items, covering three dimensions: resilience, strength, and optimism. It uses a Likert 5-point scale, with each item scored from "never" to "almost always" ranging from 0 to 4 points. The total score ranges from 0 to 100, with higher scores indicating a higher level of psychological resilience and stronger adaptability. The Cronbach's α coefficient of this scale is 0.961, and the Cronbach's α coefficients of each dimension range from 0.720 to 0.944 [12].

2.2.2. Data Collection

After receiving unified training, the investigators explained the research content and purpose to the patients. After obtaining their consent, they distributed questionnaires on-site and allowed sufficient time for the patients to fill them out themselves. They promptly answered any questions raised by the patients regarding the items. For patients with low educational levels or those who were inconvenient to fill out, the investigators would explain each item one by one without any additional explanations. The patients would independently select the answers. After the patients finished filling out the questionnaires, they were collected and the validity and completeness of the questionnaires were checked.

2.2.3. Data Analysis

The questionnaire results were entered in parallel by two individuals using EpiData 3.1 and the consistency was verified. Data analysis was conducted using SPSS 26.0. The descriptive statistics for measurement data and count data were presented using mean, standard deviation, number of cases, and proportion. The influence of general patient information on psychological resilience in patients undergoing thyroid nodule ablation was analyzed using t-test and analysis of variance. The relationship between preoperative anxiety and depression in patients undergoing thyroid nodule ablation and psychological resilience was analyzed using Pearson correlation analysis. Multivariate stepwise regression was used to explore the factors influencing psychological resilience in patients undergoing thyroid nodule ablation. A difference was considered statistically significant if $P<0.05$.

2.2.4. Ethical Considerations

During the conduct of this research, great attention was paid to research ethics and the rights and interests of the participants. Before data collection, the research proposal and methodology underwent ethical review. Careful evaluations were conducted on aspects such as the research purpose and significance, research design and methods, participant selection process, methods for obtaining informed consent, potential risks and benefits to the participants, privacy and confidentiality measures, data management and storage procedures, and the release of research results. Participation was voluntary, and informed consent was obtained from all participants. Throughout the research process and when reporting the research results, strict measures were taken to protect the privacy and confidentiality of the participants.

3. Results

3.1. General Information's of Patients Undergoing Thyroid Nodule Ablation

A total of 190 questionnaires were distributed in this study, and 182 valid questionnaires were retrieved, with an effective recovery rate of 95.79%. The study revealed that among the 182 patients who underwent thyroid nodule ablation, their ages ranged from 17 to 74 (47.60±12.52) years old, and their body mass index was (24.55±3.31) kg/m^2. The remaining general information is shown in Table 2.

3.2. The Preoperative Psychological Status Scores of Patients Undergoing Thyroid Nodule Ablation Surgery

Table 1. Scores of Psychological Status of Patients Undergoing Thyroid Nodule Ablation Before Surgery (n = 182)

Project	Minimum value	Maximum value	Score
Anxiety	25	61	38.24±6.66
Depression	27	73	46.81±6.78
Psychological resilience	34	90	63.46±9.22
Tenacity	17	48	32.51±5.39
Strength	9	32	21.82±3.70
Optimism	4	25	9.19±1.92

This study shows that among 182 patients undergoing thyroid nodule ablation, the anxiety score was (38.24±6.66) points, the depression score was (46.81±6.78) points, and the psychological resilience score was (63.46 ± 9.22) points. Among them, there were 17 (9.34%) patients without anxiety, 16 (8.79%) patients with mild anxiety, 1 (0.55%) patient with moderate anxiety, and 0 (0%) patient with severe anxiety; the number of depression patients was 33 (18.13%), the number of mild depression patients was 27 (14.83%), the number of moderate depression patients was 5 (2.75%), and the number of severe anxiety patients was 0 (0%). As shown in Table 1.

3.3. Univariate Analysis of Preoperative Psychological Resilience in Patients Undergoing Thyroid Nodule Ablation

Table 2. Univariate Analysis of Preoperative Psychological Resilience in Patients Undergoing Thyroid Nodule Ablation

Characteristic		Number of cases (composition ratio)	Psychological resilience score	Statistical value	P
Gender	male	33(18.1%)	69.09±6.095	5.256[a]	<0.001
	female	149(81.9%)	62.21±9.345		
Age	<45	71(39.0%)	64.83±10.046	1.992[b]	0.139
	45-60	85(46.7%)	63.15±8.490		
	>60	26(14.3%)	60.73±8.803		
BMI	<18.49	2(1.10%)	59.00±4.234	0.227[b]	0.878
	18.5-23.99	81(44.50%)	63.47±8.454		
	24.0-27.99	74(40.66%)	63.30±10.226		
	≥28	25(13.74%)	64.28±9.004		
Place of residence	Rural	55(30.22%)	60.53±10.263	-2.881[a]	0.004
	Town	127(69.78%)	64.73±8.463		
Marital status	Married	171(93.96%)	63.38±9.190	-0.469[a]	0.640
	Unmarried	11(6.04%)	64.73±10.071		
Educational attainment	Secondary school and below	116(63.74%)	62.45±9.194	2.548[b]	0.081
	Junior college and undergraduate	63(34.61%)	65.51±9.172		
	Postgraduate degree or above	3(1.65%)	59.67±3.786		
Work status	Unemployed	62(34.06%)	59.35±9.124	6.966[b]	<0.001
	Employed	71(39.01%)	66.00±9.280		
	Reading	9(4.95%)	64.67±10.524		
	Retirement	40(21.98%)	65.05±6.759		
Occupation	Worker	23(12.64%)	62.87±5.895	5.405[b]	<0.001
	Professional and technical personnel	31(17.03%)	66.16±9.930		
	Farmer	50(27.47%)	59.20±8.832		
	Staff members of state organs	12(6.59%)	69.67±6.800		
	Others	60(32.97%)	64.50±9.334		
Annual household income	<80,000 yuan	96(52.75%)	61.55±9.502	-3.017[a]	0.003
	≥80,000 yuan	86(47.25%)	65.59±8.452		
Medical payment methods	Self-paid medical treatment	4(2.20%)	67.50±16.052	6.946[b]	<0.001
	Resident medical insurance	19(10.44%)	62.79±10.042		
	Employee medical insurance	100(54.94%)	65.83±7.747		
	New Rural Cooperative Medical insurance	59(32.42%)	59.39±9.512		
Nodule type	Class 3	119(65.38%)	63.25±9.478	3.095[b]	0.028
	Class 4A	41(22.53%)	65.83±8.312		
	Class 4B	13(7.14%)	57.15±9.344		
	Class 4C	9(4.95%)	64.56±5.199		
Nodules numbers	1	37(20.33%)	65.05±10.033	1.674[b]	0.190
	2	45(24.73%)	64.64±10.377		
	≥3	100(54.94%)	62.34±8.255		
Nodule nature	Benign	171(93.96%)	63.55±0.014	0.508[a]	0.612
	Malignant	11(6.04%)	62.09±12.470		
Nodule size	<1cm	29(16.02%)	62.90±10.762	0.072[b]	0.930
	≥1cm	81(44.75%)	63.65±8.791		
	Both	71(39.23%)	63.52±9.213		
Course of the disease	<6m	63(34.62%)	64.68±10.037	0.875[b]	0.419
	6m-12m	17(9.34%)	62.29±6.697		
	≥12m	102(56.04%)	62.90±9.054		
The degree of understanding of the disease	Have no idea at all	73(40.11%)	61.45±9.348	4.687[b]	0.010
	Partial understanding	89(48.90%)	64.06±9.052		
	Basic understanding	20(10.99%)	68.15±7.686		
Other diseases	have	89(48.90%)	61.91±8.255	2.245[a]	0.026
	no	93(51.10%)	64.95±9.877		
Smoking	have	15(8.24%)	67.93±5.934	1.976[a]	0.050
	no	167(91.76%)	63.06±9.369		
Drinking alcohol	have	20(10.99%)	67.45±9.801	2.069[a]	0.040
	no	162(89.01%)	62.79±9.058		
Exercise	Exercise occasionally	102(56.04%)	62.15±9.646	-2.194[a]	0.030
	Exercise regularly	80(43.96%)	65.14±8.414		

Note: a t value; b F value.

The results of the single-factor analysis showed that the gender, place of residence, occupation type, family annual income, medical payment method, type of thyroid nodule, and the level of understanding of the disease of patients undergoing thyroid nodule ablation had an impact on the preoperative psychological resilience score of the patients (P<0.05). As shown in Table 2.

3.4. Correlation Analysis of Preoperative Anxiety, Depression and psychological Resilience in Patients undergoing Thyroid Nodule Ablation

The results of Pearson correlation analysis showed that the preoperative psychological resilience of patients undergoing thyroid nodule ablation was negatively correlated with their anxiety and depression. As shown in Table 3.

Table 3. Correlation Analysis of Preoperative Anxiety, Depression and psychological Resilience in Patients undergoing Thyroid Nodule Ablation (r Value)

Project	Psychological resilience	Tenacity	Strength	Optimism
SAS	-0.463**	-0.461**	-0.406**	-0.161*
SDS	-0.491**	-0.473**	-0.446**	-0.189*

*Note: **At the 0.01 test level, the correlation is significant. *At the 0.05 test level, the correlation was significant*

3.5. Multivariate Analysis of Preoperative Psychological Resilience in Patients Undergoing Thyroid Nodule Ablation

The total score of psychological resilience of patients with thyroid nodule ablation was taken as the dependent variable, and the variables with statistical significance in the univariate analysis and correlation analysis were taken as the independent variables for multiple factor stepwise regression analysis. The regression analysis results showed that the patient's gender, working status, understanding of the disease, anxiety status, and depression status entered the regression equation. As shown in Table 4 and 5.

Table 4. Assignment Method of Influencing Factors

Influencing factors	Assignment method
Gender	male=1, female=2
Place of residence	Rural=1, Town=2
Work status	Unemployed=1, Employed=2, Reading=3, Retirement=4
Occupation	Worker=1, Professional and technical personnel=2, Farmer=3, Staff members of state organs=4, Others=5
Annual household income	<80,000 yuan=1, ≥80,000 yuan=2
Medical payment methods	Self-paid medical treatment=1, Resident medical insurance=2, Employee medical insurance=3, New Rural Cooperative Medical insurance=4
Nodule type	Class 3=1, Class 4A=2, Class 4B=3, Class 4C=4
The degree of understanding of the disease	Have no idea at all=1, Partial understanding=2, Basic understanding=3
Other diseases	have=1, no=2
Smoking	have=1, no=2
Drinking alcohol	have=1, no=2
Exercise	Exercise occasionally=1, Exercise regularly=2
SAS	Original data
SDS	Original data

Table 5. Multivariate stepwise regression analysis of preoperative psychological resilience in patients undergoing thyroid nodule ablation

Influencing factors	B	Standard error	Beta	t	P	95%CI	
						Lower limit	Upper limit
Constant	93.227	4.793	-	19.451	<0.001	83.768	102.686
Gender	-3.594	1.512	-0.151	-2.377	0.019	-6.679	-0.610
Occupation	1.291	0.515	0.157	2.505	0.013	0.274	2.308
The degree of understanding of the disease	2.147	0.875	0.152	2.453	0.015	0.420	3.874
SDS	-0.364	0.125	-0.268	-2.924	0.004	-0.610	-0.118
SAS	-0.330	0.125	-0.238	-2.649	0.009	-0.576	-0.084

Note: R=0.593, R^2=0.352, Adjusted R^2 =0.333, F=19.080, P<0.001.

4. Discussion

In recent years, due to changes in lifestyle, increased life stress, and the widespread use of ultrasound diagnostic techniques, the incidence and detection rate of thyroid nodules have been increasing year by year, and the age of onset is showing a trend of youngerening [9, 13, 14]. It is estimated that the positive rate of thyroid nodules in China is 22.53% to 43.70%, and 20% to 76% of adults have at least one thyroid nodule [10].

4.1. The Current Preoperative Psychological Status of Patients Undergoing Thyroid Nodule Ablation

The American Psychiatric Association states that thyroid disorders are one of the causes of psychological problems. Long-term thyroid dysfunction may deplete norepinephrine, thereby leading to the occurrence of psychological problems [11]. The results of this study show that the preoperative anxiety scores and depression scores of patients with thyroid nodules ablation were higher than the domestic norm (37.23 ± 12.58) points and (41.88 ± 10.57) points [12]; the psychological resilience scores were lower than the domestic healthy adult scores (70.50±13.48) points [13], significantly lower than the scores of the general population in the United States (80.4 ± 12.8) points [8]. Thyroid nodules not only affect the psychological condition of patients, causing symptoms such as anxiety and depression, but also lead to a decline in psychological resilience and quality of life [14]. Thyroid nodule ablation as a stressor not only brings psychological pressure to patients, causing psychological problems such as worry and fear [15], but also requires patients to bear a heavier economic burden. To some extent, they feel guilty for not being able to work and instead needing to be taken care of, and also worry about the lives of their families, treatment costs, and efficacy, etc. This leads to more intense psychological pressure, an increased risk of negative emotions, and a lower level of psychological resilience.

4.2. Influencing Factors of Psychological Resilience in Patients Undergoing Thyroid Nodule Ablation Surgery

Psychological resilience is an individual's ability to actively cope with adversity, enabling them to have a certain degree of resistance when facing adversity [17], and to positively confront difficulties or diseases, promoting physical and psychological recovery [18]. The results of single-factor analysis and multiple-factor stepwise regression analysis showed that the preoperative psychological resilience of patients with thyroid nodule ablation was mainly influenced by gender, work status, understanding of the disease, and anxiety and depression status.

4.2.1. Gender

This study found that gender is an independent influencing factor for psychological resilience (P<0.05). The preoperative psychological resilience level of male patients was higher than that of female patients, which was consistent with the research results of Fuller-Thomson, E. [11]. Analyzing the reasons, apart from social responsibilities, women bear more family responsibilities than men, such as supporting parents and educating children. Moreover, the characteristics of women themselves [19] make them have limited capacity to withstand pressure and be more prone to psychological problems, resulting in a lower level of psychological resilience. Therefore, more attention should be paid to the psychological conditions of female patients, timely answering their doubts, understanding their needs, encouraging them to actively cope with the disease, and at the same time, encouraging family members to provide more support for female patients to enhance their confidence in overcoming the disease.

4.2.2. Work Status

This study found that the working status is an independent influencing factor for psychological resilience (P<0.05). The preoperative psychological resilience levels of employed and retired patients were higher than those of students and unemployed individuals, which was consistent with the research results of Liu Xiaoyu [20]. Analyzing the reasons, employed patients who receive corresponding compensation and retired patients who receive pensions have a certain economic foundation, less economic pressure, and higher psychological resilience levels. Students, on the other hand, are generally younger and have no economic sources. They still need financial support from their families. At the same time, patients at this stage have not truly entered society and face less pressure, and their psychological resilience levels are relatively at the medium level. The unemployed patients have the lowest psychological resilience levels. Patients themselves have no economic sources, and they also need to bear family responsibilities. Their psychological pressure is the greatest, and they are more likely to have psychological problems, with the lowest psychological resilience levels. Therefore, special attention should be paid to the psychological conditions of unemployed patients and students, timely detection of changes in psychological status, providing more support, relieving patients' pressure, and improving patients' psychological tolerance.

4.2.3. The Degree of Understanding of the Disease

This study found that the level of understanding of the disease is an independent influencing factor for psychological resilience (P<0.05), and it is positively correlated with the preoperative psychological resilience level of patients, which is consistent with the research results of Kamisli. [21]. Analyzing the reasons, patients with incomplete understanding of the disease have a stronger fear of the disease, are unable to communicate better with medical staff, cannot clearly express their needs, receive less support, and have a lower level of psychological resilience. Therefore, diversified and effective feasible health education methods [22] should be adopted. According to the different needs of patients, disease knowledge should be targetedally educated [23], and nurse-patient communication should be strengthened to meet patients' needs for disease knowledge as much as possible.

4.2.4. Anxiety and Depression Conditions

This study found that anxiety and depression are independent influencing factors of psychological resilience (P<0.05), negatively correlated with the patients' preoperative psychological resilience, and consistent with the results of Basal. [24]. Analyzing the reasons, the disease itself increases patients' fear and uncertainty, which is likely to cause changes in their psychological conditions. In addition, factors such as medical expenses expenditure will aggravate the patients' psychological stress response, prompting the

emergence of negative emotions such as anxiety and depression. The more severe the anxiety and depression conditions are, the worse the patients' psychological conditions will be, and their ability to cope with and adapt to adversity will be poorer, with a lower level of psychological resilience. Therefore, it is necessary to communicate with the patients and their families in a timely manner, understand their psychological changes, and when patients show anxiety or depression conditions, provide targeted emotional support to the patients to stimulate their potential to resolve negative emotions, enabling them to face problems with a positive and proactive attitude [25].

In conclusion, gender, working status, understanding of the disease, anxiety and depression levels are the main influencing factors affecting the preoperative psychological resilience of patients with thyroid nodules ablation. In daily care, different measures should be taken based on the psychological conditions of different patients and the influencing factors to improve their psychological resilience levels.

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