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Latent Profile Analysis of Post-Surgical Psychological Distress in Young Thyroid Cancer Patients and Its Association with Self-Management Efficacy

Jia Zhang*, Dan Xiong*, Chaixiu Li, Dan Li, Yinhuan Wang*, Yanmei Fang*, Ying Yang*

Department of Breast and Thyroid Surgery, Southwest Hospital, Army Medical University, Chongqing, 400038, People's Republic of China

*These authors contributed equally to this work

Correspondence: Ying Yang, Department of Breast and Thyroid Surgery, Southwest Hospital, Army Medical University, Chongqing, 400038, People's Republic of China, Tel +86 139-83192689, Email yang2004@tmmu.edu.cn

Purpose: Psychological distress (PD) is one of the most prevalent psychological challenges among young patients with thyroid cancer. Recognizing the symptoms of psychological distress among young cancers at different stages is essential for improving their quality of life. This study aims to identify distinct profiles of psychological distress in young thyroid cancer patients post-surgery and assess differences in self-management efficacy across these profiles.

Methods: This cross-sectional study was carried out in one general hospital in Chongqing, China. Participants completed the data collection on sociodemographic information, the specific Cancer Distress Scales for Adolescents and Young Adults (CDS-AYA), and the Strategies Used by People to Promote Health (SUPPH). Latent profile analysis was utilized to classify psychological distress into distinct subgroups, and analysis of covariance (ANCOVA) was employed to examine differences in self-management efficacy across these subgroups.

Results: A total of 213 valid questionnaires were collected. Ultimately, three distinct profiles of psychological distress were identified: "low PD group" (67.1%), "moderate PD group" (25.8%), and "high PD group" (7.1%). Statistically significant differences were observed among these groups with respect to monthly economic income, underlying diseases, treatment modalities, tumor node metastasis (TNM) staging, and cervical lymph node dissection ($F = 36.308$, $P < 0.001$). Additionally, there were statistically significant variations in self-management efficacy scores across the three subgroups.

Conclusion: Healthcare professionals ought to implement targeted interventions to tackle the heterogeneity of psychological distress, thereby assisting young with thyroid cancer in lowering their level of psychological distress and enhancing their ability to self-manage their disease.

Keywords: young adults, thyroid cancer, psychological distress, latent profile analysis, self-management efficacy

Introduction

The global incidence of thyroid cancer is increasing annually, and the number of incidence cases rapidly increased from 212,000 cases in 2008 to 821000 cases in 2022, ranking among the top seventh high-incidence cancers in the world.[1,2] In addition, China has the largest number of new cases and deaths of thyroid cancer in the world.[3] Compared with most cancers, the incidence of thyroid cancer tends to be more pronounced among younger populations.[4,5] Several studies have shown that thyroid cancer is the most common type of cancer among young adults in all countries.[5,6] Although thyroid cancer has a better prognosis in young adults, with a 5-year survival rate approaching 100%,[4,7,8] long-term survival does not necessarily restore their quality of life completely, and young adults are at a critical stage of professional development and socialization, and the cancer experience may have a more profound psychological impact on this population.[9,10]

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Psychological distress (PD) is a multifactorial cause of unpleasant emotional experiences in patients, including psychological, cognitive, behavioral, social, and spiritual dimensions, which can affect patients' attitudes and behaviors to cope positively with cancer (somatic symptoms and side effects of treatment).[11] This can be a sensitive reflection of patients' quality of life in clinical settings.[12] Young adults diagnosed with cancer report more psychological distress than their healthy peers, including negative emotions, post-traumatic stress, and obsessive worrying.[13] Studies have shown that 29.33% to 43.3% of young adults with thyroid cancer have significant psychological distress.[14] It has been demonstrated by certain studies that protracted, enduring psychological distress can exert a detrimental effect on patients' capacity for self-management of their disease, with serious repercussions for their recovery and prognosis.[15,16]

Stress coping theory posits that stress is determined not only by the external event itself but also significantly influenced by an individual's subjective psychological appraisal of the event and their chosen coping strategies.[17] Effective coping mechanisms can facilitate adaptation to illness and enhance psychological well-being, whereas inadequate coping strategies may intensify stress or contribute to psychological problems.[17] Self-management efficacy functions as a critical resource that enhances cancer patients' self-management abilities and coping strategies for managing the disease.[18] Patients with a strong sense of self-management efficacy are more likely to perceive the disease as a manageable challenge rather than a threat. This perception encourages them to adopt proactive coping strategies, thereby alleviating psychological distress.[19] However, young patients with thyroid cancer are more susceptible to the "stigmatized" fear associated with cancer, and they tend to experience more pronounced negative emotions.[20–22] They must not only address the conflict between treatment and their academic or career development but also adhere to long-term (or even lifelong) thyroid hormone therapy following surgery.[6,23] As a result, it imposes a greater requirement on the effectiveness of patient self-management efficacy.

As a negative psychological state, psychological distress not only affects patients' negative views of the disease but also affects patients' ability to actively cope with the disease.[15] In addition, psychological distress is not a single-dimensional problem but is interwoven by multiple psychological levels. Digging into the different categories of psychological distress can help to understand the psychological state of patients more comprehensively, and provide more targeted guidance for taking measures to improve the self-management ability of patients. Most existing studies have relied solely on the total score of the psychological distress scale as the criterion for determining the presence of psychological distress symptoms in thyroid cancer patients, thereby overlooking individual differences at the same level.[14,20,24] If we can identify the heterogeneity of psychological distress in young patients with thyroid cancer in advance, it will facilitate the early recognition of varying degrees of psychological distress symptoms.[25] This would enable the timely implementation of preoperative and postoperative hierarchical psychological interventions for patients, thereby contributing to the reduction of their negative emotions, encouraging them to confront the disease with positive attitudes and behaviors, and enhancing their self-management efficacy regarding the disease. Latent profile analysis (LPA), an individual-centered statistical method to determine the classification of an individual's latent traits through the individual's response pattern on extraneous variables, helps to examine the characteristics of different latent-profile populations further.[26] Consequently, our study employed LPA to evaluate the potential characteristics of psychological distress in young thyroid cancer patients post-surgery, and to explore the relationship between distinct categories of psychological distress and self-management efficacy. This research aims to provide a theoretical foundation for developing individualized psychological interventions tailored to various types of psychological distress experienced by young adults with thyroid cancer.

Materials and Methods

Study Design and Participants

This cross-sectional study was conducted in Chongqing, China. Participants were recruited by convenience sampling in the Breast and Thyroid Surgery Department of a general hospital from February to July 2023. Patients were eligible if they (1) were aged 18–39 years;[5] (2) patients diagnosed with other malignant tumors during the same time, and (3) were informed of the condition. Exclusion criteria: (1) those who had mental illness, and (2) those with other malignant tumors in combination, (3) patients with distant metastasis or advanced cancer. The sample size of the influencing factor study is

at least 5–10 times the number of variables.[27] In this study, there were 14 independent variables and the sample size was taken as 10 times the number of independent variables while considering a 20% failure rate. Therefore, this study required a sample size of at least 168 cases.

Measures

General Information Questionnaire

This study used a self-designed questionnaire to collect data on sociodemographic information and clinical characteristics of young thyroid cancer patients. The questionnaire included 14 items: gender, age, education level, marital status, occupation, children, duration of illness, monthly economic income, payment for medical expenses, tumor-node-metastasis (TNM), treatment modality, underlying disease, extent of thyroidectomy, cervical lymph node dissection.

Psychological Distress

The specific Cancer Distress Scales for Adolescents and Young Adults (CDS-AYA) was designed to measure psychological distress in young adults with cancer (Tsangaris, D'Agostino, Rae, Breakey, and Klassen, 2019). The content included the impact of cancer (11 items), physical (10 items), emotional (10 items), cognitive (8 items), cancer worry (5 items), and employment/schooling (6 items), totaling 50 items across the six dimensions. The items were assessed using a four-point Likert scale. The CDS-AYA has a total score of 0–150 points; the higher the score, the more severe the psychological problems the patient has and the higher the degree of psychological distress. The Cronbach's α for the Chinese version of the CDS-AYA was 0.971.[28]

Self-Management Effectiveness

The Strategies Used by People to Promote Health (SUPPH) have been designed to measure individual self-management skills.[29] The content included positive attitudes (15 items), self-stress reduction (3 items), and self-determination (10 items), totaling 28 items across three dimensions. The items were assessed on a five-point Likert scale. SUPPH has a total score of 28–140 points. The higher the score, the higher the patient's self-management ability level. The internal consistency of the Chinese version of the SUPPH total and subscale scores was high (Cronbach's α ranged from 0.849 to 0.970).[30]

Data Collection

Data for this study was primarily gathered through a combination of paper-based and electronic questionnaires. Before the young adults with thyroid cancer were discharged from the hospital after surgery, three nurses explained the purpose, significance, and precautions of the study using consistent terms. After obtaining the participants' consent and having them sign the informed consent form, they were given the option to complete the questionnaire in either paper or electronic format according to their preference. For participants who completed the questionnaire, it took about 15 to 20 minutes to finish. After participants completed the questionnaires, nurses reviewed them to ensure completeness. Participants with incomplete questionnaires were asked to provide the missing information. All items in the electronic questionnaire were mandatory, automatically generated after submission, and could only be filled out once for the same account to ensure completeness and avoid duplication. The link to the electronic questionnaire was https://wj.qq.com/s2/11773516/d989/.

Statistical Analysis

Our study used Mplus 8.3 to conduct LPA. Model fit was assessed using the Akaike (AIC) and Bayesian (BIC) information criteria, adjusted BIC (aBIC), entropy, and Lo-Mendell-Rubin (LMRT) and bootstrap (BLRT) indicate better fit. Entropy ranges from 0 to 1, with values closer to 1 indicating more accurate classification. Statistically significant differences in LMRT and BLRT suggest that k-profile models outperform k-1 profile models. While these indices guide decision-making, category interpretability is also crucial for selecting the best model.[27]

Then, we used SPSS 27.0 software for statistical analysis. Count data were expressed as frequencies and percentages, and measurement data were expressed as mean and standard deviation (M ± SD). Kruskal–Wallis H and chi-square tests

or Fisher's exact probability method were used to conduct univariate analyses of potential psychological distress profiles in young patients with thyroid cancer. Sociodemographic and disease-related variables significant in univariate analyses were included as independent variables, while psychological distress of young thyroid cancer subgroups were treated as dependent variables. Then, we used multifactorial unordered logistic regression analysis to conduct. A two-by-two comparison of self-management efficacy scores of patients with different categories of psychological distress using the least significance difference test method (LSD). $P<0.05$ level was considered statistically significant.

Results

Characteristics of the Participants

A total of 227 questionnaires were received, including 116 electronic questionnaires and 111 paper questionnaires. Of these, 14 were excluded as invalid (2 incomplete, 12 with all options consistent). The remaining 213 valid questionnaires were included in the final sample with a valid recovery rate of 93.8%. The sample consisted of 213 young adults with thyroid cancer, with a mean age of 32.79 years (SD = 4.57). The majority of the participants were female (71.8%), married (81.3%), and had a college/university and above (72.8%). Regarding monthly economic income, 46.9% reported earning between 5000–10,000 yuan. In terms of treatment, 69% had undergone surgery. The detailed demographic characteristics are presented in Table 1.

Table 1 Characteristics of the 213 Young Adults with Thyroid Cancer

Characteristics		Low PD Group (n=143)	Moderate PD Group (n=55)	High PD Group (n=15)	χ^2/H	P
Gender	Male	44(30.8%)	14(25.5%)	2(13.3%)	2.0310[a]	0.315
	Female	99(69.2%)	41(74.5%)	13(86.7%)		
Age	18–20	3(2.1%)	0(0.0%)	1(6.7%)	1.170[b]	0.557
	21–30	28(19.6%)	9(16.4%)	1(6.7%)		
	31–39	112(78.3%)	46(83.6%)	13(86.7%)		
Education level	Junior school and below	14(9.8%)	7(12.8%)	8(53.4%)	7.305	0.001
	High school	20(14.0%)	7(12.8%)	2(13.3%)		
	College/university and above	109(76.2%)	41(74.6%)	5(33.3%)		
Marital status	No spouse	30(21.0%)	9(16.4%)	1(6.7%)	2.107[a]	0.349
	Have a spouse	113(79.0%)	46(83.6%)	14(93.3%)		
Children	None	44(30.8%)	13(23.6%)	1(6.7%)	4.463[a]	0.107
	Yes	99(69.2%)	42(76.4%)	14(93.3%)		
Occupation	None	7(4.9%)	6(10.9%)	6(40.0%)	29.660[a]	0.001
	Student	3(2.1%)	1(1.8%)	1(6.7%)		
	Unit of business	47(32.9%)	10(18.2%)	0(0.0%)		
	Public service unit	39(27.3%)	19(34.5%)	4(26.7%)		
	Freelance work	15(10.5%)	8(14.5%)	1(6.7%)		
	Other	32(22.4%)	11(20.0%)	3(20.0%)		
Duration of illness	<1 month	17(11.9%)	4(7.3%)	1(6.7%)	3.844[c]	0.428
	1–3 month	37(25.9%)	12(21.8%)	5(33.3%)		
	3–6 month	25(17.5%)	5(9.1%)	3(20.0%)		
	6–12 month	24(16.8%)	9(16.4%)	2(13.3%)		
	≥12 month	40(28.0%)	25(45.5%)	4(26.7%)		

(*Continued*)

Table 1 (Continued).

Characteristics		Low PD Group (n=143)	Moderate PD Group (n=55)	High PD Group (n=15)	χ^2/H	*P*
Monthly economic income (yuan)	<5000	26(18.2%)	12(21.8%)	11(73.3%)	10.679[c]	0.005
	5000–10,000	68(47.6%)	28(50.9%)	4(26.7%)		
	≥10,000	49(34.3%)	15(27.3%)	0(0.0%)		
Payment for medical expenses	Resident medical	25(17.5%)	18(32.7%)	9(60.0%)	22.013[b]	0.000
	Employee medical	110(76.9%)	37(67.3%)	4(26.7%)		
	Commercial medical	3(2.1%)	0(0.0%)	1(6.7%)		
	Self-financed	5(3.5%)	0(0.0%)	1(6.7%)		
TNM	I	67(46.9%)	16(29.1%)	3(20.0%)	17.643[c]	0.000
	II	70(49.0%)	33(60.0%)	6(40.0%)		
	III	6(4.2%)	6(10.9%)	6(40.0%)		
Treatment modality	Surgery	106(74.1%)	36(65.5%)	5(33.3%)	11.003[a]	0.004
	Surgery and RAI	37(25.9%)	19(34.5%)	10(66.7%)		
Underlying disease	No	140(97.9%)	48(87.3%)	14(93.3%)	8.635[b]	0.010
	Yes	3(2.1%)	7(12.7%)	1(6.7%)		
Extent of thyroidectomy	Portion	103(72.0%)	30(54.5%)	4(26.7%)	15.258[a]	0.000
	Total	40(28.0%)	25(45.5%)	11(73.3%)		
Cervical lymph node dissection	No	125(87.4%)	39(70.9%)	6(40.0%)	22.588[a]	0.000
	Yes	18(12.6%)	16(29.1%)	9(60.0%)		

Notes: [a]χ^2; [b]Fisher's exact test; [c]Kruskal–Wallis test.
Abbreviations: PD, psychological distress; TNM, tumor-node-metastasis; RAI, radioactive 131-iodine; N, number.

Latent Profile of Psychological Distress

By using the standardized score for each dimension of the CDS-AYA scale as the manifest indicator, LPA was performed to fit 1–5 profile models sequentially. The fit index for each model is shown in Table 2. As the number of profiles increased, AIC, BIC, and aBIC values decreased. Upon retaining the three profiles, the entropy approached 1 and the LMRT and BLRT values reached significance ($P < 0.05$). After retaining the four profiles, the information evaluation indices continued to decline, and the LMRT and BLRT values also reached significance ($P < 0.05$). However, there were multiple profiles with category probabilities of less than 7%. We considered the model fit indices and the clinical relevance of the classification, and model 3 was considered the best model (Figure 1). The attribution probabilities for each potential profile ranged from 0.954 to 0.998, which also demonstrates the reasonableness of the categorization model with three potential profiles.

Young adults in Category 1 exhibited lower scores on all dimensions of psychological distress. Thus, this category was named the "low PD group", which comprised 143 patients (67.1%). In category 2, the scores of young adults on all

Table 2 Indicators for the Potential Profile of PD in Young Thyroid Cancer Patients

Profile	k	AIC	BIC	aBIC	Entropy	LMRT(*P*)	BLRT(*P*)	Proportion
1	12	3644.793	3685.128	3647.104	–	–	–	–
2	19	2966.528	3030.392	2970.187	0.982	0.0001	0.000	85.45/14.55
3	26	2750.533	2837.926	2755.540	0.946	0.0261	0.000	67.14/25.82/7.04
4	33	2671.941	2782.863	2678.296	0.929	0.0326	0.000	61.97/24.41/7.98/5.63
5	40	2659.016	2793.468	2666.719	0.931	0.8689	0.0128	3.29/60.56/ 8.45/22.07/5.63

Abbreviations: PD, psychological distress; K, free parameters; AIC, akaike information criterion; BIC, bayesian information criterion; aBIC, adjusted BIC; LMRT, Lo-Mendell-Rubin likelihood ratio; BLRT, bootstrap likelihood ratio test.

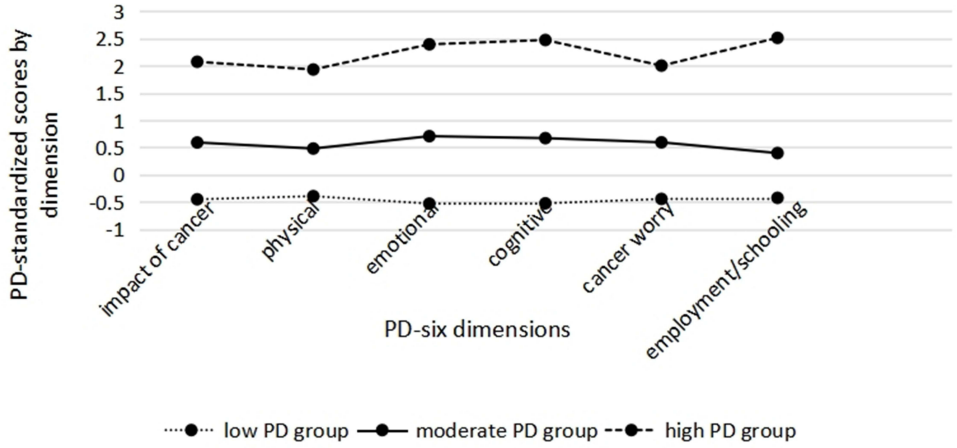

Figure 1 Three profiles of psychological distress in young adults with thyroid cancer.

psychological distress dimensions were at a medium level. Therefore, this category was named "moderate PD group", with 55 patients (25.8%). In category 3, the scores of young adults on all psychological distress dimensions were high. Thus, this category was named the "high PD group", with 15 patients (7.1%), (see Table 2).

Analysis of Factors Influencing the Potential Profile of Psychological Distress in Young Adults with Thyroid Cancer

Univariate analysis showed that the three latent models were statistically different in terms of education level, monthly economic income, occupation, payment for medical expenses, TNM, extent of thyroidectomy, underlying disease, cervical lymph node dissection and treatment modality ($P < 0.05$) (Table 1). There were no statistically significant differences when comparing different genders, ages, marital statuses, children and duration of illness ($P > 0.05$).

Compared to individuals in stage I, young patients in stage II were more likely to be classified in the moderate PD group (OR = 0.403, $P = 0.034$). Furthermore, those in stage III had a significantly higher likelihood of being categorized in either the moderate PD group (OR = 0.193, $P = 0.041$) or the high PD group (OR = 0.037, $P = 0.027$) compared to the low PD group. Compared to young in the low PD group, those with underlying disease (OR = 0.100, $P = 0.004$) and received a combined treatment regimen of surgery and RAI (OR = 3.928, $P = 0.020$) were more likely to be classified into the moderate PD group. Compared to patients who did not undergo cervical lymph node dissection, young adults who received this procedure were 0.30 times more likely to be classified in the moderate PD group compared to the low PD group (OR = 0.291, $P = 0.032$) and 0.05 times more likely to be categorized in the high PD group compared to the low PD group (OR = 0.045, $P = 0.015$). Compared to patients who underwent portion thyroidectomy, those who underwent total thyroidectomy exhibited a significantly higher likelihood of being categorized in the high PD group (OR = 0.092, $P = 0.031$). The results are shown in Table 3.

Comparison of the Scores of Self-Management Efficacy Among Young Adults with Different Subgroups

In this study, a multifactorial, unordered, logistic regression analysis was conducted, with three categories of psychological distress in young thyroid cancer patients serving as the dependent variables. The low psychological distress group was used as the reference category, and nine variables that demonstrated statistical significance in the univariate analysis were selected as the independent variables. These variables comprised education level, occupation, monthly economic income, payment for medical expenses, TNM, treatment modality, underlying disease, extent of thyroidectomy, and cervical lymph node dissection. The results showed that self-management efficacy scores of young thyroid cancer patients in the three psychological distress subgroups were as follows: the mean score of the low PD group was 105.08 (SD = 24.13), the mean score of the moderate PD group was 79.53 (SD = 18.99), and the mean score of the

Table 3 Multivariate LPA of PD in Young Thyroid Cancer Patients

Variables	C_1 vs C_2			C_1 vs C_3		
	OR	*P*	95% CI	OR	*P*	95% CI
TNM (ref: I stage)						
II	0.403	0.034	0.174~0.934	0.759	0.817	0.073~7.906
III	0.193	0.041	0.040~0.933	0.037	0.027	0.002~0.686
Underlying disease (ref: no)						
Yes	0.100	0.004	0.020~0.489	0.045	0.071	0.002~1.300
Treatment modality (ref: surgery)						
Surgery and RAI	3.928	0.020	1.240-~12.448	6.456	0.169	0.454~91.834
Cervical lymph node dissection (ref: no)						
Yes	0.291	0.032	0.094~0.899	0.045	0.015	0.004-~0.551
Extent of thyroidectomy (ref: portion)						
Total	0.492	0.099	0.212~1.143	0.092	0.031	0.011~0.809

Abbreviations: LPA, latent profile analysis; PD, psychological distress; RAI, Radioactive iodine; C1, low PD group; C2, moderate PD group; C3, high PD group; TNM, tumor-node-metastasis; Ref, Reference; RAI, radioactive 131-iodine; CI, Confidence interval.

Table 4 Comparison of Self-Management Efficacy Among Different PD Categories

Variables	N	Mean ± SD			
		Positive Attitudes	Self-Stress Reduction	Self-Determination	Self-Management Efficacy
C_1	143	56.93 ± 13.29	11.50 ± 2.86	36.63 ± 8.84	105.08 ± 24.13
C_2	55	42.69 ± 11.55	9.00 ± 2.68	27.76 ± 6.31	79.53 ± 18.99
C_3	15	36.80 ± 13.11	7.53 ± 2.80	24.00 ± 9.20	68.40 ± 24.08
F		35.436	25.097	33.194	36.308
P		<0.001	<0.001	<0.001	<0.001
η^2		0.495	0.294	0.425	0.611
LSD		C_1>C_2	C_1>C_2	C_1>C_2	C_1>C_2
		C_1>C_3	C_1>C_3	C_1>C_3	C_1>C_3

Abbreviations: PD, psychological distress; C_1, low PD group; C_2, moderate PD group; C_3, high PD group; N, frequency; LSD, the Least Significance Difference test; F, variance test; SD, standard deviation; η^2, eta-squared.

high PD group was 68.40 (SD = 24.08). The results of variance analysis showed significant differences in the scores of self-management efficacy among three subgroups ($P < 0.001$).

Further two-by-two comparisons using the Least Significance Difference test (LSD) showed that the difference between the self-management efficacy scores of the moderate PD group, the high PD group, and the low PD group was statistically significant ($P < 0.001$). There was no statistically significant difference between the moderate PD group and the high PD group when comparing scores of self-management efficacy ($P = 0.097$) (see Table 4).

Discussion

This study used LPA for the first time in young adults with thyroid cancer to analyze their psychological distress characteristics. This method helps healthcare professionals identify different subgroups of individual psychological distress in young adults with thyroid cancer from a person-centered perspective. This study found that three potential psychological distress profiles in young adults with thyroid cancer were identified: “low PD group”, “moderate PD group”, and “high PD group”.

This demonstrates the heterogeneity of psychological distress profiles in young adults with thyroid cancer. These results were similar to those of a previous study.[31] The “low PD group” totaled 67.1%, suggesting that the majority of young adults with thyroid cancer had low levels of psychological distress, which was lower than the results of studies on digestive system malignancies and breast cancer.[32] Young adults with thyroid cancer usually do not show any symptoms,

and most are only found on thyroid ultrasound during a physical examination. And after surgery, the outlook was better than for other cancers. As a result, a diagnosis of thyroid cancer did not affect the lives of young adults too much, so the fear and psychological burden of cancer was relatively low.

However, this study found that 32.9% of the moderate to high population was still in this group, which still needs to be focused on. Psychological distress is a significant mental health challenge for young adults with cancer globally and needs to be taken seriously by healthcare professionals and families. The "high PD group" accounted for 7.1%, indicating that there was a low number of young adults in this category. However, the high level of psychological distress among these individuals is of significant concern and needs to be taken seriously. Regarding the dimension scores of psychological distress, the employment/schooling dimension scored the highest, which was consistent with the previous research.[33] Young adults with cancer are at a critical stage of career development and socialization, and cancer treatment could have a direct impact on their work and life.[34]

And our study found that most of these patients were jobless, low-income, and in need of subsequent RAI treatment. For young adults with low family incomes, the cost of cancer treatment represents a significant financial burden.[35] The condition of such patients was also relatively serious, with the surgery requiring the total removal of the thyroid gland and subsequent RAI treatment. This further exacerbates the financial and psychological pressures experienced by these young adults.[36] Our study suggested that healthcare personnel and society should prioritize the mental health of jobless, low-income populations, and those with more serious conditions. Assess young adults' mental health when they first arrive to identify those who need help and provide them with the right support. Early psychological assessment on admission to identify young adults with high levels of psychological distress and implement precise interventions. Concurrently, the State finances and social welfare organizations are called upon to provide additional economic assistance and social support to the impoverished them.[37]

Our study showed that compared with the "low PD group", the patients with underlying diseases were more likely to belong to the "moderate PD group". Similar to the results of the previous research.[35,38] Patients with underlying diseases incur higher medical costs, leading to increased economic and psychological burden.[39] Studies had found that more than half of young adults with cancer reported having unmet health-related psychological needs, but relatively few of these individuals seek assistance from medical professionals, such as doctors, nurses, or psychological counselors.[40,41] Therefore, Health care workers should take the initiative to communicate with young adults through the establishment of patient support groups, the organization of patient churches and fellowship activities, as well as regular follow-up visits and telephone consultations. In these way, the increases the communication opportunities and channels among doctors, nurses and young adults, and helps young adults to reduce their psychological pressure.

This study demonstrated that compared with the "low PD group", the young adults with thyroid cancer who were treated with surgery and RAI were more likely to belong to the "moderate PD group", which was consistent with previous study results.[36] Radiation therapy is performed and may cause gastrointestinal reactions, radiation thyroiditis, radiation pneumonitis, bone marrow suppression and so on.[42] Young adults with thyroid cancer who need to continue to receive RAI therapy after surgery face the adverse effects of radiation therapy, as well as an increase in the cost and duration of treatment, which would increase the degree of psychological suffering. Nurses could assist young adults undergoing RAI therapy by informing them of the associated risks and providing educational and psychosocial support resources.[9] Additionally, protecting other organs and tissues during RAI therapy should be prioritized to minimize potential radiation damage. Radiologists, in particular, should take care to safeguard the young adults' other organs and tissues during RAI treatment.

This study reported that compared with the "low PD group" the higher the TNM stage, the greater the probability that young with thyroid cancer belonged to the "high PD group". This suggested that the higher the TNM stage and the more serious the disease, the higher the psychological distress level of patients, which aligns with previous results.[43] A higher TNM stage typically indicates a more complex surgical procedure. Consequently, patients are at a higher risk of experiencing postoperative complications such as hoarseness and dysphagia.[44] Social support from various sources, including healthcare professionals, and family and peer relationships, plays an important role in the mental health of young with cancer.[45] Doctors and nurses should advocate for families and society to provide increased care and support

to thyroid cancer patients. This can help alleviate their negative emotions, reduce psychological stress, and offer more favorable support.

Psychological distress has been identified as the most serious mental health problem existing in young adults with cancer, and long-term, persistent psychological distress could adversely affect the quality of sleep, mental health, disease self-management, and overall quality of survival in young adults.[46] Our study revealed that there were significant differences in self-management efficacy scores among the three groups with different categories of psychological distress. Comparison between the groups revealed that the "low PD group" scored significantly higher on self-management efficacy than the other two groups ($P < 0.001$). Self-management efficacy is crucial for maintaining individuals' physical and mental health. When patients leverage their initiative to modify and regulate their behavior, they tend to adopt a more positive attitude toward disease treatment, which facilitates better disease management.[18,47] Additionally, this approach can mitigate the adverse effects of illness to some extent, thereby reducing levels of pain, fatigue, and psychological stress.[18,48] Therefore, healthcare professionals should assess the psychological status of young adults as early as possible before surgery, screen out patients with high levels of psychological distress in a timely manner, and take targeted coping measures according to the different characteristics of the patients, so as to alleviate the negative emotions of the young adults and enhance the confidence in the recovery of the disease.

Study Limitations

This study has three limitations that should be acknowledged. (1) The CDS-AYA scale was utilized in this study to evaluate the psychological condition of young patients. Nevertheless, potential reporting bias should be acknowledged, as the scale depends on patient self-reports. (2) The single-center design and relatively small sample size may limit the generalization of the findings to the broader population of young adults with thyroid cancer. (3) This study was primarily a cross-sectional study, and some potential confounders were not taken into account. (4) Psychological distress is a dynamic process, and the present study focused only on changes in patients at a single postoperative time point, which may not reflect trends in the categorization of psychological distress over time. Consequently, (1) future studies may explore conducting a multi-regional, multi-center investigation at the national level, excluding potential confounders and leveraging objectively measurable indicators to further validate the findings of this study. (2) Psychological distress is a dynamic process. In the future, dynamic evaluations of psychological distress on patients can be carried out at various time points, such as the time of diagnosis, pre-surgery, post-surgery, and from 3 to 6 months after discharge, to further investigate the temporal variations in the classification of psychological distress and to validate its predictive relationship with self-management efficacy.

Clinical Implications

More than half of young adults with thyroid cancer exhibit symptoms of psychological distress, and 32.9% of young patients experience moderate to high levels of psychological distress, which warrants serious attention. In the process of treating and caring for these patients, medical staff should communicate more frequently with young adults with cancer to understand their psychological status. Medical personnel should utilize relevant tools to promptly identify young patients with higher levels of psychological distress and provide timely, effective, and precise interventions. Additionally, doctors and nurses should emphasize the importance of self-management efficacy during disease treatment and rehabilitation. Furthermore, society should pay attention to young adults and their families with lower financial incomes, providing them with more financial support and assistance.

Conclusion

This study identified three subgroups of psychological distress in young adults with thyroid cancer after surgery. Underlying disease, TNM stage, treatment modality, received with cervical lymph node dissection and with extent of thyroidectomy could affect the potential psychological distress of young adults with thyroid cancer. The three subgroups of psychological distress differed in self-management efficacy scores. The study informs interventions to reduce psychological distress. Medical staff should pay attention to the psychological health status of young adults with thyroid cancer and take targeted timely intervention measures according to the characteristics of the different subgroups. Our

study indicates that psychological distress may be associated with illness coping ability, social support from family and friends, and other factors. Future research could further investigate this relationship by employing relevant scales to assess and analyze the influence and role of additional potential factors.

Data Sharing Statement

All authors of the study can view and use all data from the study. Data can be provided to the publisher from the corresponding author.

Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the First Affiliated Hospital of Army Medical University [(A)KY2023021].

Consent for Publish

Patients signed informed consent regarding publishing their data.

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