

Stigma and Its Influencing Factors Among Chinese Patients with Thyroid-Associated Ophthalmopathy: A Cross-Sectional Study

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Purpose: To understand the current situation of stigma among patients with thyroid-associated ophthalmopathy (TAO) in China and analyze its influencing factors, to provide a theoretical basis for medical staff to provide targeted intervention measures.

Patients and Methods: From March to December 2024, 217 patients with TAO were recruited from a tertiary care general hospital in Sichuan Province, China, using a convenience sampling method. Participants completed several assessments, including a general information questionnaire, the Chinese version of the Stigma Scale for Chronic Illness (SSCI), the Medical Coping Modes Questionnaire (MCMQ), and the Huaxi Emotional Distress Index (HEI). Statistical analysis was performed using SPSS 27.0. A generalized linear model was constructed to analyze the factors influencing stigma in TAO patients, using general demographic characteristics, medical coping style scores, and emotional distress scores as independent variables, and stigma scores as the dependent variable.

Results: This cross-sectional study included 217 TAO patients, predominantly female (72.4%), with an average age of 45.06±11.92 years. The stigma score among TAO patients in China was 34.00 (26.00, 47.00). Univariate analysis and multivariate analysis showed that male gender ($B=-3.736$, 95% CI: -6.755, -0.717), aged 18–35 years ($B=9.182$, 95% CI: 1.899, 16.464), with a junior secondary school education ($B=6.510$, 95% CI: 2.434, 10.587), less than 5 ophthalmology visits within a year ($B=-6.730$, 95% CI: -11.631, -1.829), mild ($B=-10.098$, 95% CI: -15.482, -4.715) and moderately severe ($B=-7.406$, 95% CI: -12.469, -2.343) TAO grading, resignation coping ($B=1.029$, 95% CI: 0.407, 1.651), and emotional distress ($B=0.405$, 95% CI: 0.129, 0.682) had significant difference on stigma ($P<0.05$). The gender-stratified analysis revealed heterogeneity in the factors influencing stigma between men and women, indicating a need for precise, group-specific intervention strategies.

Conclusion: Gender, age, education level, number of ophthalmology visits within a year, classification of TAO, resignation coping, and emotional distress are the influencing factors of stigma for TAO patients in China. It is suggested that medical staff should incorporate stigma assessment into clinical routine screening of TAO patients, and pay attention to the emotional state of high-risk groups, so as to identify individuals with high stigma level in time and provide necessary psychological support and intervention.

Keywords: thyroid-associated ophthalmopathy, stigma, resignation coping, emotional distress, influencing factors

Introduction

Thyroid-associated ophthalmopathy (TAO) is an organ-specific autoimmune disorder and holds the highest incidence rate among orbital diseases in adults.¹ The clinical manifestations of TAO are diverse and include eyelid retraction (unilateral or bilateral), proptosis, diplopia, and restrictive strabismus. In severe cases, patients may develop exposure keratitis and optic neuropathy, which can ultimately result in blindness and disability, thereby posing significant challenges to clinical management.² China is recognized as one of the countries with a notably high incidence of Graves' disease (GD) globally. Among GD patients of Asian descent, the prevalence of TAO can reach as high as 45%.³ The population affected by TAO is substantial, and their visual health and overall quality of life have been significantly compromised. TAO can disrupt normal orbital anatomy, leading to impairments in both appearance and visual function. Visual impairment may hinder daily activities such as reading, driving, and working. Additionally, changes in appearance—



such as exophthalmos and strabismus—are highly visible and often become focal points in social interactions, may contribute to psychosocial distress.^{4,5} Consequently, compared to other chronic ocular diseases, TAO patients are at increased risk of reduced quality of life, social dysfunction, and unemployment.⁶

In his seminal theory of stigma, Goffman posited that “stigma” refers to a characteristic that “damages” social identity. He notably differentiated between “visible stigma”, such as disfiguring appearances, and “invisible stigma”.⁷ Based on this framework, the proptosis and facial alterations associated with TAO can be classified as a quintessential form of visible illness stigma. The symptoms are overtly apparent and difficult to conceal, akin to skin lesions resulting from psoriasis, scars left by burns, or facial paralysis along with other functional impairments.^{8–10} Such visibility often invites excessive scrutiny, curiosity, fear, and even social exclusion from others. This external manifestation perpetually exposes patients to potential stigmatization risks, compelling them to navigate awkwardness and pressure in their social interactions frequently. The stigma model developed by Link and Phelan identifies five core components of stigma formation: labels, stereotypes, separation, loss of status, and discrimination.¹¹ Within this framework, patients with TAO are frequently subjected to external labels such as “protruding eyes” and associated with negative stereotypes like “strange” and “abnormal”. This labeling often leads to social avoidance and occupational discrimination, ultimately resulting in a decline in their social status and detrimental effects on their mental health.¹² Moreover, within the context of Chinese culture, the concept of “face”, which is essential for maintaining social relationships and personal dignity, significantly influences patients’ perceptions and experiences of stigma. Research conducted by Yang LH et al suggests that face culture (mianzi) may intensify the experience of stigma related to illness.¹³ For TAO patients, the disfigurement caused by their condition not only undermines their personal sense of “face”, but it may also be perceived as a burden on their families. This perception can lead to an acute fear of losing face. Consequently, this cultural and psychological pressure may drive patients toward coping strategies such as social withdrawal, thereby exacerbating their psychological distress and further diminishing their social functioning.

Coping styles refer to the behaviors or strategies individuals employ to adapt to changes when encountering stressful situations or events. These styles are crucial in regulating psychological stress responses and maintaining physical and psychological well-being, including emotional health and behavioral adjustments.¹⁴ Medical coping refers to patients’ various strategies and approaches to manage their illnesses, including confrontation, avoidance, and resignation.¹⁵ Different coping styles adopted by patients significantly influence their disease prognosis, physical and mental health, as well as overall quality of life.¹⁶ The Lazarus stress-coping model posits that an individual’s appraisal and coping strategies directly influence their psychological and physiological reactions to stress, impacting their adaptive capacity and overall health outcomes.¹⁷ This model provides a theoretical framework for understanding how individuals perceive, cope with, and psychologically adjust to stress. Research has indicated that individual coping strategies are associated with stigma; for instance, resignation coping is linked to stigma among patients suffering from diabetic foot ulcers.¹⁸

TAO has been shown to impact patients’ mental health significantly.¹⁹ In recent years, psychosocial health issues associated with TAO have been reported in various countries. For instance, a cross-sectional study conducted in the United States involving 100 patients with chronic TAO revealed that mental health issues are highly prevalent among this patient population. Specifically, 42% of the participants reported experiencing anxiety and/or depression, which is more than double the prevalence rate of mental health disorders observed in the general adult population in the United States.²⁰ A study conducted in South Korea, which compared the quality of life and depressive status between patients with TAO and the general population, shows that the prevalence of depression among TAO patients is 32.7%. This figure is significantly higher than that observed in ordinary individuals.²¹ Existing research indicates a positive correlation between stigma and symptoms of anxiety and depression, with severe manifestations of these symptoms further exacerbating perceived stigma.^{22,23} However, there is currently a lack of empirical survey data on the mental health status—particularly anxiety and depression—among TAO patients in China. Consequently, it remains unclear whether and how anxiety and depression symptoms influence the experience of stigma in this specific patient population.

At present, there is a lack of quantitative research on the relationship between TAO patients’ stigma and their psychosocial factors (such as coping styles, emotional state) and objective clinical indicators (such as disease severity). In order to fill this gap, this study aims to assess the level of stigma in TAO patients through quantitative methods and explore its related influencing factors, in order to provide a theoretical basis for medical staff to implement targeted

intervention measures. Based on the above theory and clinical observations, we hypothesized that stigma is associated with female gender, disease severity, negative emotion, and resignation coping.

Methods

Study Design

This study is designed as a cross-sectional analysis. The research report complies with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.²⁴

Study Setting and Sampling

This study was a single-center, hospital-based, cross-sectional study conducted between March to December 2024. Patients with TAO were recruited in the ophthalmology outpatient department and inpatient department of a large tertiary-level general hospital in Sichuan Province, China, using a convenience sampling method. Inclusion criteria were: (1) a confirmed diagnosis of TAO by an ophthalmologist based on the 2022 Chinese Guidelines for the Diagnosis and Treatment of Thyroid Associated Ophthalmopathy,²⁵ and (2) 18 years or older. Exclusion criteria included: (1) a prior confirmed diagnosis of psychiatric disorders, such as anxiety and/or depression, before the onset of TAO (exclusion is made through patient self-report and medical record review); (2) inability to comprehend or refusal to complete the questionnaire; and (3) a history of ocular trauma, surgery, or other serious eye diseases. This study encompassed 16 variables. Following Kendall's principle of sample size calculation, the sample size was determined to be ten times the number of dependent variables.²⁶ Taking into account a 20% inefficiency factor, the minimum required sample size was established at 192 cases. A total of 230 eligible TAO patients were recruited for the face-to-face survey in this study. 13 incomplete or invalid response questionnaires were excluded, resulting in 217 valid responses, which achieved a 94.3% response rate.

We performed a post hoc power analysis to quantify the statistical test power of this study. The G*Power software was utilized, configured to detect a moderate effect (Cohen's $f^2 = 0.15$), with a significance level set at $\alpha = 0.05$. The results indicate that, given the current sample size ($N = 217$), the statistical power for detecting the significant effect observed in this study is 0.95 (> 0.80). This suggests that the sample size employed in this research is adequate for reliably identifying clinically substantial associations.

Research Tools

Demographic and Clinical Characteristics Questionnaire

The researcher developed a self-designed demographic and clinical characteristics questionnaire, which included the following variables: age, gender, marital status, education level, employment status, average monthly household income, duration of TAO, number of ophthalmology visits and hospitalizations within the past year, clinical grading of TAO, classification of proptosis, current treatment methods, and thyroid functional status.

Stigma Scale for Chronic Illness

In this study, the Chinese version of the Stigma Scale for Chronic Illness (SSCI) was used to assess the level of stigma among TAO patients. Initially developed by Rao et al in 2009,²⁷ the scale was subsequently translated and culturally adapted by Deng et al in 2017.²⁸ The scale comprises 24 items, categorized into extrinsic stigma and intrinsic stigma. Extrinsic stigma refers to perceived discrimination from others due to the illness, while intrinsic stigma reflects the internalization of negative stereotypes and self-directed stigma. The scale is based on a 5-point Likert scale, and the total score ranges from 24 to 120, with higher scores indicating higher levels of stigma. The scale has a Cronbach's α coefficient of 0.949 and a test-retest reliability of 0.802.²⁹ In the current study, the overall Cronbach's α coefficient for the scale was 0.914, and the Cronbach's α coefficients of each dimension were 0.916 and 0.793.

Medical Coping Modes Questionnaire

The Chinese version of the Medical Coping Modes Questionnaire (MCMQ) was employed to assess patients' coping styles. Initially developed by Feifel et al in 1987,¹⁵ the scale was later translated and culturally adapted by Shen and Jiang in 2000.³⁰ The questionnaire consists of 3 dimensions: confrontation, avoidance, and resignation. There are 20 entries on

a 4-point Likert scale of 1, 2, 3, and 4 from lowest to highest, with entries 1, 4, 9, 10, 12, 13, 18, and 19 being reverse-scored entries. Higher scores indicate a greater tendency to adopt the corresponding coping style. The Cronbach's α coefficients for each dimension were 0.69, 0.60, and 0.76, respectively.³¹ In the present study, the Cronbach's α coefficients were 0.605 for confrontation, 0.543 for avoidance, and 0.815 for resignation.

Huaxi Emotional Distress Index

The Huaxi Emotional Distress Index (HEI) was used to screen for depression and anxiety in non-psychiatric clinical populations in China. The scale was developed by researchers from the Centre for Mental Health at West China Hospital, Sichuan University and has a total of 9 items.³² Responses are recorded on a 5-point Likert scale, total scores ranging from 0 to 36. Scores ≤ 8 indicate no emotional distress; 9–12 indicate mild distress; 13–16 reflect moderate distress; and scores ≥ 17 signify severe emotional distress. Compared with other anxiety and depression assessment scales, this scale is more culturally and linguistically effective and takes less time (2–3 minutes to complete). It can be used to efficiently and effectively screen anxiety and depression in Chinese healthcare settings. The Cronbach's α coefficient for the original scale was 0.917,³³ and in the present study, the coefficient was 0.827.

Data Collection

Before the formal data collection, a pilot survey was conducted with 20 TAO patients to evaluate the quality of the questionnaire items. Revisions were made based on their feedback to ensure the quality of the final questionnaire. To reduce the bias caused by the convenience sampling method, questionnaires were collected anonymously, and patients of different ages, genders, disease courses, TAO grading, and proptosis were selected as much as possible. Moreover, the researchers have received training related to stigma and possess the ability to empathize, enabling patients to feel safe, understood, and not judged. The primary survey was conducted in a quiet and private setting within the clinic or ward. Patients independently completed the questionnaire after the researcher provided a standardized explanation of the study's purpose, instructions, and precautions. If participants had questions during the process, the researcher clarified using standardized instructions. Responses completed in under 3 minutes or displaying uniform answer patterns were excluded to ensure data quality. The questionnaire completion time was controlled within 3 to 10 minutes. To safeguard the privacy of participants, all collected data were de-identified before being entered into the analysis system. All data utilized in the research process underwent anonymization. A two-person independent data entry and verification procedure was implemented to minimize potential bias. In this study, to address missing data present in the questionnaire, we employed the list deletion method for processing.

Data Analysis

This study utilized SPSS version 27.0 for statistical analysis. Categorical data are presented as frequencies and percentages. Group comparisons were performed using the Mann–Whitney U -test or the Kruskal–Wallis H -test. Correlations among SSCI, MCMQ, and HEI were assessed using Spearman correlation analysis. The analysis of the model residuals in this study reveals a significant violation of the normality assumption (Shapiro–Wilk test $P < 0.001$; both the histogram and Q–Q plot exhibit considerable skewness), while the scatter plot indicates heterogeneity in the variance of the residuals. Given that the prerequisites for ordinary least squares (OLS) regression were not satisfied, this study employed a generalized linear model for analysis. Before constructing the model, multicollinearity diagnostics were performed on all independent variables, with Variance Inflation Factors (VIF) ranging from 1.035 to 1.377, indicating no serious multicollinearity issues among these variables. Model 1: A basic model was established, incorporating age, educational level, average monthly family income, and duration of TAO as control variables. Model 2: Building upon Model 1, additional variables—namely gender, occupation, number of ophthalmology visits and hospitalizations within one year, TAO grading, resignation coping, and emotional distress—that demonstrated statistically significant correlations with stigma through Mann–Whitney U -tests, Kruskal–Wallis H -tests, and correlation analyses were included. The goodness-of-fit for each model was assessed using $-2LL$ (log-likelihood), Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC). The box plot method was employed to identify extreme values in both the dependent variable and the primary continuous independent variable. No significant cases of extreme values were

detected, suggesting that the data quality of this sample is satisfactory. Subsequently, robust standard errors were utilized to re-estimate the model in order to assess its stability. The results indicate that the research findings are not unduly affected by data characteristics, thereby demonstrating good robustness in the research outcomes (Refer to [Supplementary Materials Table 1](#)). A two-sided test was utilized with a significance level set at $\alpha = 0.05$.

Results

Characteristics of the Participants

A total of 217 patients with TAO participated in this study, with a mean age of 45.06 ± 11.92 years (range: 20–74 years). Among them, 60 (27.6%) were male, and 157 (72.4%) were female. Most participants (89.9%) were married, and nearly half (46.1%) had received tertiary or higher education. The disease duration ranged from 0 to 24 months, with most patients (74.2%) having experienced the condition for less than six months. According to the clinical grading of TAO disease proposed by the European Group on Graves Orbitopathy (EUGOGO),³⁴ about 62.2% of the patients had moderate-to-severe disease. Approximately 33.2% of patients had ocular proptosis less than the upper limit of the normal value of +3mm. All participants were in the active phase of TAO. The rest of the detailed information can be found in [Table 1](#).

SSCI, MCMQ, and HEI Scores in TAO Patients

The results indicated that the SSCI score of TAO patients was 34.00 (26.00,47.00), the confrontation coping score was 18.00 (17.00,20.00), the avoidance coping score was 10.00 (9.00,12.00), and the resignation coping score was 5.00 (5.00,7.00). The HEI score was 0(0,7.00) points ([Table 2](#)).

Table 1 Demographic Characteristics of TAO Patients and Univariate Analysis of Stigma Scores (N=217)

Variables	Categories	N (%)	Scores M(P ₂₅ , P ₇₅)	Z/H	P
Gender	Male	60(27.6)	27.50(24.00,42.75)	-3.237	0.001**
	Female	157(72.4)	37.00(28.00,47.50)		
Age	18-35	52 (24)	37.00(28.00,48.00)	2.904	0.234
	36-45	57 (26.3)	31.00(26.00,43.50)		
	46-60	93 (42.9)	36.00(26.00,47.50)		
	>60	15 (6.9)	28.00(24.00,34.00)		
	Marital status	Married	195(89.9)		
	Unmarried/divorced/widowed	22 (10.1)	29.00(26.00,46.00)		
Education level	Primary or under	29 (13.4)	35.00(26.50,46.50)	1.857	0.603
	Junior secondary school	46 (21.2)	39.00(26.75,51.00)		
	High school	42 (19.4)	32.50(26.00,46.50)		
	Colleges and above	100(46.1)	32.00(26.00,46.00)		
Employment status	Employed	132(60.8)	34.50(27.00,48.00)	11.679	0.009**
	Unemployed	34 (15.7)	37.50(32.75,48.25)		
	Retired	36 (16.6)	28.00(24.25,43.00)		
	Other	15 (6.9)	26.00(24.00,40.00)		
Household monthly income (yuan/month/person)	<3000	47 (21.7)	37.00(27.00,49.00)	0.872	0.832
	3000-4999	50 (23.0)	33.50(27.75,43.00)		
	5000-10,000	67 (30.9)	34.00(26.00,48.00)		
	>10,000	53 (24.4)	31.00(26.00,46.00)		
Number of ophthalmology visits Within a year (times)	<5	147(67.7)	32.00(26.00,46.00)	8.834	0.012*
	5-10	52 (24.0)	38.00(26.00,48.00)		
	>10	18 (8.3)	44.00(37.00,53.00)		

(Continued)

Table 1 (Continued).

Variables	Categories	N (%)	Scores M(P ₂₅ , P ₇₅)	Z/H	P
Duration of TAO (months)	<6	161 (74.2)	34.00(26.00,47.00)	0.278	0.870
	6-12	50 (23.0)	34.00(26.00,46.00)		
	13-24	6 (2.8)	38.00(25.50,46.75)		
TAO Grading	Mild	66 (30.4)	30.50(26.00,40.50)	12.985	0.002**
	Moderately severe	135(62.2)	34.00(26.00,48.00)		
	Extremely heavy	16 (7.4)	47.50(40.25,61.00)		
Classification of proptosis	0	72 (33.2)	31.00(26.00,42.00)	6.899	0.075
	a	66 (30.4)	32.50(26.00,46.50)		
	b	60 (27.6)	37.00(26.00,49.00)		
	c	19 (8.8)	43.00(30.00,53.00)		
Treatment methods	Drug therapy	3 (1.4)	46.00(35.00,49.50)	1.113	0.774
	Orbital decompression surgery	3 (1.4)	32.00(29.50,34.50)		
	Radiotherapy	60 (27.6)	37.50(26.00,48.50)		
	Periocular injection	151(69.6)	34.00(26.00,46.00)		
Thyroid function	Euthyroid	46 (21.2)	32.50(26.00,42.25)	1.175	0.556
	Hyperthyroid	160(73.7)	35.00(26.00,48.00)		
	Hypothyroid	11 (5.1)	33.00(27.00,43.00)		

Notes: * $P<0.05$, ** $P<0.01$; Z, Mann–Whitney U-test; H, Kruskal–Wallis H-test. Classification of proptosis: 0 means proptosis < upper limit of the normal value +3mm. a means proptosis is at the upper limit of the normal value +3~4mm. b means proptosis is at the upper limit of the normal value +5~7mm. c means proptosis \geq upper limit of the normal value +8mm.

Table 2 SSCI, MCMQ, and HEI Scores of TAO Patients (N=217)

Variables	Categories	Scores M(P ₂₅ , P ₇₅)	Mean score of Items M(P ₂₅ , P ₇₅)
SSCI scores	—	34.00(26.00,47.00)	1.40(1.08, 1.95)
	Intrinsic stigma	22.00(15.00,32.00)	1.69(1.15, 2.46)
	Extrinsic stigma	11.00(11.00,14.00)	1.00(1.00, 1.27)
MCMQ scores	—	—	—
	Confrontation	18.00(17.00,20.00)	2.25(2.13, 2.50)
	Avoidance	10.00(9.00,12.00)	1.43(1.29, 1.71)
	Resignation	5.00(5.00,7.00)	1.00(1.00, 1.40)
HEI scores	—	0(0, 7.00)	0(0, 0.78)

Abbreviations: SSCI, Stigma Scale for Chronic Illness; MCMQ, Medical Coping Modes Questionnaire; HEI, Huaxi Emotional Distress Index.

Bivariate Correlations Among All the Variables

Correlation analyses revealed that stigma was positively associated with resignation coping ($r=0.372$, $P<0.001$) and emotional distress ($r=0.344$, $P<0.001$). Additionally, resignation coping was positively associated with emotional distress ($r=0.399$, $P<0.001$).

Generalized Linear Model Analysis of Influencing Factors of Stigma in TAO Patients

The generalized linear model was employed to analyze the factors influencing stigma in patients with TAO. Initially, we established a baseline model that included only confounding variables such as age, educational level, average monthly household income, and the duration of TAO. Subsequently, statistically significant variables identified in the univariate analysis—namely gender, occupation, number of ophthalmology visits and hospitalizations within one year, TAO grading, resignation coping, and emotional distress—were incorporated to develop a comprehensive model. The results indicated that the factors influencing stigma among TAO patients ($P<0.05$) were as follows: In Model 1, the significant factors included age and educational level; whereas in Model 2, additional factors such as gender, number of

ophthalmology visits within one year, TAO grading, resignation coping, and emotional distress were also considered. The specific interpretations are detailed below: Compared to patients over 60 years old, those aged 18–35 exhibited a stigma score that was higher by 9.182 points ($P=0.013$; 95% $CI=1.899, 16.464$). Furthermore, when compared to patients with a college degree or higher education level, individuals with only a junior high school education had an increased stigma score by 6.510 points ($P=0.002$; 95% $CI=2.434, 10.587$). Male TAO patients had stigma scores that were 3.736 points lower than those of female patients ($P=0.015$, 95% $CI=-6.755, -0.717$). Patients with fewer than 5 ophthalmology visits within one year exhibited stigma scores that were 6.730 points lower compared to those with more than 10 ophthalmology visits ($P=0.007$, 95% $CI=-11.631, -1.829$). Disease severity was also a significant influencing factor: milder forms of TAO were associated with reduced stigma. Compared to patients with extremely severe TAO, those classified as mild had stigma scores that were 10.098 points lower ($P<0.001$, 95% $CI: -15.482, -4.715$), and moderate to severe patients scored 7.406 points lower ($P=0.004$, 95% $CI: -12.469, -2.343$). Higher levels of stigma are significantly correlated with a higher level of resignation coping, as well as more severe emotional distress. Each 1-point increase in the emotional distress score was associated with a 0.405-point rise in stigma ($P=0.005$, 95% $CI: 0.129, 0.682$), and each 1-point increase in resignation coping corresponded to a 1.029-point increase in stigma ($P=0.001$, 95% $CI=0.407, 1.651$). Furthermore, the interaction term of “emotional distress \times resignation coping” did not demonstrate a significant predictive effect on stigma ($P=0.495$), indicating that the influences of these two factors on stigma are relatively independent. Detailed findings are presented in Table 3.

Comparison of Prediction Probability and Goodness of Fit of Each Model

Use the change values Δ -2LL, Δ AIC, and Δ BIC of -2LL, AIC, and BIC to compare the predictive probabilities and goodness of fit between Model 1 and Model 2. Smaller values of Δ -2LL, Δ AIC, and Δ BIC indicate a better model fit and a greater influence of the corresponding factors within the model. Refer to Table 4 for details.

Table 3 Generalized Linear Model Analysis of TAO Patients' Stigma (N=217)

Model	Variables	B	SE	β	95% CI	Wald χ^2	P
Model 1	(Intercept)	29.758	5.626	–	18.730,40.787	27.969	<0.001**
	Age						
	18-35	10.891	3.623	0.936	3.789,17.994	9.033	0.003*
	36-45	5.114	3.404	0.440	-1.559,11.786	2.256	0.133
	46-60	5.904	3.217	0.507	-0.402,12.210	3.367	0.066
	>60	Ref	–	–	–	–	–
	Education level						
	Primary or under	3.281	2.931	0.282	-2.465,9.027	1.252	0.263
	Junior secondary school	5.836	2.401	0.502	1.131,10.541	5.910	0.015*
	High school	2.165	2.252	0.186	-2.251,6.580	0.923	0.337
	Colleges and above	Ref	–	–	–	–	–
	Household monthly income (yuan/month/person)						
	<3000	1.105	2.679	0.095	-4.146,6.357	0.170	0.680
	3000-4999	0.258	2.379	0.022	-4.406,4.921	0.012	0.914
	5000-10,000	1.535	2.135	0.132	-2.649,5.720	0.517	0.472
	>10000	Ref	–	–	–	–	–
	Duration of TAO (months)						
	<6	-1.941	4.856	-0.167	-11.460,7.577	0.160	0.689
	6-12	-2.922	4.988	-0.251	-12.699,6.856	0.343	0.558
	13-24	Ref	–	–	–	–	–

(Continued)

Table 3 (Continued).

Model	Variables	B	SE	β	95% CI	Wald χ^2	P
Model 2	(Intercept)	31.896	6.745	–	18.676,45.115	22.363	<0.001**
	Age						
	18-35	9.182	3.715	0.789	1.899,16.464	6.107	0.013*
	36-45	5.466	3.517	0.470	–1.428,12.359	2.415	0.120
	46-60	4.784	3.008	0.411	–1.111,10.680	2.530	0.112
	>60	Ref	–	–	–	–	–
	Education level						
	Primary or under	4.280	2.611	0.368	–0.838,9.397	2.687	0.101
	Junior secondary school	6.510	2.079	0.560	2.434,10.587	9.800	0.002**
	High school	3.140	1.949	0.270	–0.681,6.961	2.595	0.107
	Colleges and above	Ref	–	–	–	–	–
	Household monthly income (yuan/month/person)						
	<3000	–1.925	2.369	–0.165	–6.569,2.719	0.660	0.416
	3000-4999	–1.308	2.087	–0.112	–5.399,2.782	0.393	0.531
	5000-10,000	1.050	1.831	0.090	–2.539,4.639	0.329	0.566
	>10000	Ref	–	–	–	–	–
	Duration of TAO (months)						
	<6	–0.895	4.178	–0.077	–9.084,7.294	0.046	0.830
	6-12	0.449	4.291	0.039	–7.963,8.860	0.011	0.917
	13-24	Ref	–	–	–	–	–
	Gender						
	Male	–3.736	1.540	–0.321	–6.755, –0.717	5.883	0.015*
	Female	Ref	–	–	–	–	–
	Employment status						
	Employed	4.005	2.668	0.344	–1.225,9.236	2.253	0.133
	Unemployed	4.863	3.130	0.418	–1.273,10.998	2.413	0.120
	Retired	4.797	3.406	0.412	–1.879,11.473	1.983	0.159
	Other	Ref	–	–	–	–	–
	Number of visits in a year (times)						
	<5	–6.730	2.501	–0.579	–11.631, –1.829	7.244	0.007**
	5~10	–4.801	2.745	–0.413	–10.182,0.580	3.058	0.080
>10	Ref	–	–	–	–	–	
TAO Grading							
Mild	–10.098	2.746	–0.868	–15.482, –4.715	13.517	<0.001**	
Moderately severe	–7.406	2.583	–0.637	–12.469, –2.343	8.220	0.004**	
Extremely heavy	Ref	–	–	–	–	–	
Emotional distress	0.405	0.141	0.192	0.129,0.682	8.250	0.004**	
Resignation coping	1.029	0.317	0.218	0.407,1.651	10.522	0.001**	

Notes: * $P < 0.05$, ** $P < 0.01$.

Table 4 Comparison of Prediction Probability and Goodness of Fit of Each Model

Model	–2LL	Δ –2LL	AIC	Δ AIC	BIC	Δ BIC
Model 1	1663.918	–	1689.919	–	1733.858	–
Model 2	1587.390	–76.528	1633.389	–56.530	1711.127	–22.731

Notes: Δ is the change, which is the change value of the prediction probability and goodness of fit of each model based on Model 1.

Robustness Test of the Multivariate Model

Based on the sample score terciles, patients were categorized into three grades: mild (<28 points), moderate (28–43 points), and severe (>43 points). The parallel lines test confirmed that the proportional odds assumption was met ($P=0.132$). The analysis identified several factors significantly associated with higher stigma levels: male gender ($OR=0.458$, 95% CI: 0.241, 0.872, $P=0.017$), fewer than five clinical visits ($OR=0.307$, 95% CI: 0.106, 0.885, $P=0.030$), mild TAO grading ($OR=0.117$, 95% CI: 0.031, 0.443, $P=0.001$), moderate to severe TAO grading ($OR=0.158$, 95% CI: 0.044, 0.566, $P=0.005$), greater use of resignation coping ($OR=1.185$, 95% CI: 1.031, 1.361, $P=0.016$), and higher emotional distress ($OR=1.095$, 95% CI: 1.027, 1.168, $P=0.005$). These consistent findings support the robustness of the study results.

Gender-Based Hierarchical Generalized Linear Model

A stratified analysis was conducted to examine the stigma experienced by patients with TAO, categorized by gender. The core variables that demonstrated statistical significance ($P<0.05$) in the comprehensive model were incorporated into this analysis. The findings indicated that the factors influencing stigma among female patients included age between 18 and 35 years ($P=0.004$, 95% CI=3.472, 18.657), an educational level of junior high school ($P=0.002$, 95% CI=2.607, 11.409), and a number of visits fewer than five times ($P=0.027$, 95% CI=-11.816, -0.715). Additionally, mild TAO was associated with stigma ($P=0.003$, 95% CI=-15.813, -3.271), as well as moderate TAO ($P=0.038$, 95% CI=-12.334, -0.340). Emotional distress also emerged as a significant factor ($P=0.008$, 95% CI=0.106, 0.707), along with resignation coping ($P=0.005$, 95% CI=0.300, 1.668). In contrast, for male patients, the factors contributing to stigma were identified as mild TAO ($P=0.018$, 95% CI=-25.623, -2.446) and moderate to severe TAO ($P=0.015$, 95% CI=-22.810, -2.483). Refer to Table 5 for further details.

To gain a comprehensive understanding of the findings from this study, we developed an integrated theoretical conceptual model (Figure 1). This model is grounded in Lazarus' stress-coping theory and incorporates objective disease stress factors (such as disease severity and number of visits), cognitive evaluation processes (including emotional distress

Table 5 Hierarchical Generalized Linear Model of Stigma by Gender (n=217)

Model	Variables	B	SE	β	95% CI	Wald χ^2	P
Female	(Intercept)	32.983	5.432	–	22.335, 43.632	36.859	<0.001**
	Age						
	18-35	11.064	3.873	0.951	3.472, 18.657	8.157	0.004**
	36-45	5.965	3.6908	0.513	-1.269, 13.198	2.612	0.106
	46-60	5.755	3.522	0.495	-1.148, 12.658	2.670	0.102
	>60	Ref	–	–	–	–	–
	Education level						
	Primary or under	2.567	2.839	0.221	-2.999, 8.133	0.817	0.366
	Junior secondary school	7.008	2.245	0.602	2.607, 11.409	9.740	0.002**
	High school	3.064	2.227	0.263	-1.300, 7.429	1.894	0.169
	Colleges and above	Ref	–	–	–	–	–
	Number of visits in a year (times)						
	<5	-6.265	2.831	-0.539	-11.816, -0.715	4.895	0.027*
	5~10	-4.160	3.179	-0.358	-10.391, 2.072	1.712	0.191
	>10	Ref	–	–	–	–	–
	TAO Grading						
	Mild	-9.542	3.199	-0.820	-15.813, -3.271	8.893	0.003**
	Moderately severe	-6.337	3.059	-0.545	-12.334, -0.340	4.289	0.038*
	Extremely heavy	Ref	–	–	–	–	–
	Emotional distress	0.407	0.1533	0.193	0.106, 0.707	7.034	0.008**
Resignation coping	0.984	0.3490	0.208	0.300, 1.668	7.949	0.005**	

(Continued)

Table 5 (Continued).

Model	Variables	B	SE	β	95% CI	Wald χ^2	P
Male	(Intercept)	44.401	8.232	–	28.266, 60.535	29.090	<0.001**
	Age						
	18-35	-1.104	5.2420	-0.095	-11.378, 9.170	0.044	0.833
	36-45	1.789	4.721	0.154	-7.464, 11.042	0.144	0.705
	46-60	1.596	4.450	0.137	-7.127, 10.318	0.129	0.720
	>60	Ref	–	–	–	–	–
	Education level						
	Primary or under	3.821	4.224	0.328	-4.458, 12.100	0.818	0.366
	Junior secondary school	3.314	3.799	0.285	-4.132, 10.761	0.761	0.383
	High school	1.360	3.534	0.117	-5.568, 8.287	0.148	0.700
	Colleges and above	Ref	–	–	–	–	–
	Number of visits in a year (times)						
	<5	-8.278	4.614	-0.712	-17.322, 0.766	3.218	0.073
	5-10	-7.105	4.974	-0.611	-16.855, 2.645	2.040	0.153
	>10	Ref	–	–	–	–	–
	TAO Grading						
	Mild	-14.034	5.912	-1.206	-25.623, -2.446	5.634	0.018*
	Moderately severe	-12.647	5.1857	-1.087	-22.810, -2.483	5.947	0.015*
	Extremely heavy	Ref	–	–	–	–	–
	Emotional distress	0.629	0.367	0.298	-0.091, 1.350	2.929	0.087
Resignation coping	0.711	0.672	0.150	-0.607, 2.029	1.118	0.290	

Notes: * $P < 0.05$, ** $P < 0.01$.

and resignation coping), and sociodemographic background variables (like gender and educational level) within a coherent framework. This framework elucidates how these elements collectively contribute to the adverse psychosocial adaptation outcome of stigma. It is important to note that this cross-sectional study aims to assess the strength of associations among these variables; however, its design does not allow for confirmation of causal relationships as indicated by the arrows in the figure Future longitudinal studies will be necessary to validate these pathways.

Discussion

This study represents the first evaluation of stigma levels among Chinese patients with TAO and its influencing factors. Our research revealed that mild stigma is prevalent among TAO patients, significantly correlating with female gender, age, educational level, clinical grading of TAO, frequency of medical visits, resignation coping, and emotional distress.

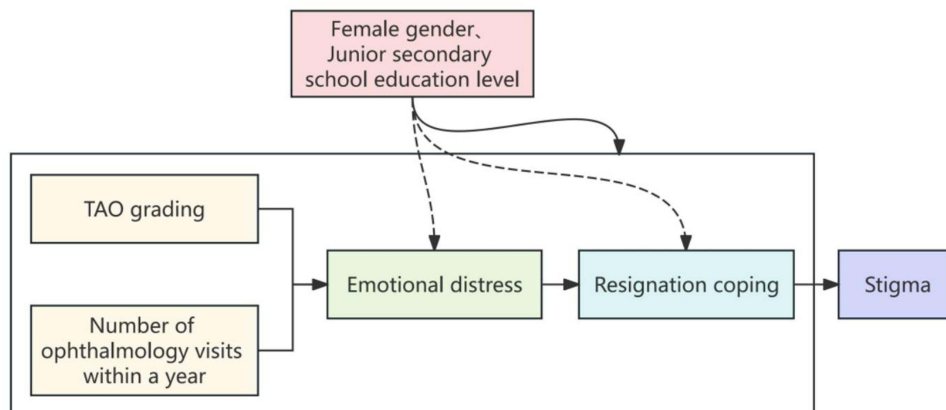


Figure 1 Conceptual model of stigma pathways in TAO patients.

These findings may serve as a foundation for providing targeted psychological support and interventions for TAO patients in the future.

Analysis of Scores on Stigma, Medical Coping Styles, and Emotional Distress of TAO Patients

The results of this study indicate a median stigma score of 34.00 (26.00, 47.00) among the 217 TAO patients. Although this indicates that the overall level of self-reported stigma may not be serious, the clinical significance of this finding deserves further investigation, as even a low score can affect the health of patients. The reasons for the stigma of TAO patients may be related to the symptoms such as proptosis, strabismus, diplopia, and vision loss caused by the disease, which to a large extent affect the facial beauty and visual function of the patients. The stigma level observed in this study was lower than that reported in patients undergoing eye evisceration,³⁵ a difference potentially attributable to the fact that approximately one-third of participants (33.2%) exhibited proptosis within the standard limit of +3mm, resulting in less conspicuous facial changes. Notably, the score for intrinsic stigma 22.00 (15.00,32.00) exceeded that of extrinsic stigma 11.00 (11.00,14.00), indicating that TAO patients are more inclined to internalize negative societal perceptions, which may contribute to substantial psychological distress. According to Goffman's stigma theory and Lazarus' coping theory,^{7,17} the changes in visibility and appearance caused by TAO expose patients to a "damaged identity". This threat to social identity constitutes a continuous source of psychological stress. When individuals perceive this pressure as insurmountable, they may resort to an emotion-centered coping strategy known as the "resignation response". However, this approach not only fails to resolve the underlying issues but also exacerbates emotional distress, ultimately leading to the internalization of social stigma as self-stigma and creating a psychological pathway of stigma. In the context of Chinese culture, the concept of "face", which is central to maintaining social harmony and personal dignity, significantly influences this internalization process. Patients with TAO may be more inclined to conceal their condition and avoid social interactions due to concerns that their illness will compromise their "face". This fear of "losing face" intensifies their internalized sense of stigma, potentially worsening their condition and resulting in psychological trauma.³⁶ In addition, nearly half (44.70%) of the patients in this study reported a monthly family income of less than 5000 yuan. Furthermore, the course of TAO is prolonged and necessitates long-term treatment. Patients express concerns that medical expenses may impose a significant financial burden on their families, which can easily lead to negative emotions such as self-blame and guilt. This emotional distress may subsequently trigger and exacerbate the stigma associated with the disease.

In this study, the majority of TAO patients demonstrated a tendency to adopt a confrontation coping style. This preference may be attributable to the threat that TAO poses to visual function. In severe instances, the condition can lead to corneal ulceration, perforation, and even irreversible vision loss, among other serious outcomes. The fear of blindness likely motivates patients to closely monitor disease progression and actively pursue medical intervention. Moreover, as all participants were recruited from outpatient settings, this population may exhibit higher treatment and follow-up compliance, potentially introducing a degree of selection bias. Nevertheless, a subset of TAO patients in this study employed negative coping strategies—such as avoidance and resignation—failing to engage actively in treatment or decision-making processes. This passive approach may contribute to disease progression, heighten psychological burden, and ultimately give rise to mental health complications.

The results of this study show that among the 217 TAO patients, 45 individuals had negative emotion scores greater than 8, indicating that approximately 20.74% of patients experienced mental health issues such as anxiety and depression. This proportion is lower than the reported prevalence of anxiety and depression among TAO patients in the United States and South Korea.^{20,21} Such differences may be attributed to variations in assessment tools, sampling methods, and other contextual factors.

Impact of Demographic Factors on the Stigma of TAO Patients

Our study found that male TAO patients reported lower levels of stigma compared to female patients, a result consistent with the findings of Peng et al³⁷ in their research on stigma among patients with head and neck cancer. This phenomenon may be attributed to the unique challenges frequently faced by women—including social stigmatization, familial

caregiving responsibilities, and potential gender-based discrimination. These factors can shape individuals' perceptions of their illness and influence their coping strategies, thereby promoting greater internalization of stigma.³⁸ Furthermore, women tend to place greater emphasis on physical appearance and experience stronger appearance-related pressures, whereas male patients are generally more concerned with visual function impairments due to their direct impact on activities of daily living and occupational functioning. Furthermore, gender stratification analysis revealed the heterogeneity of the influencing factors of stigma in patients with TAO. For female patients, even a mild clinical grade was associated with heightened stigma if they were younger or had a lower educational level. In contrast, stigma in male patients was primarily driven by objective clinical indicators. These findings underscore the necessity of incorporating gender-specific considerations into future intervention designs. For female patients, particularly younger individuals with lower education, interventions should routinely assess emotional state and coping styles. The focus should be on providing cognitive behavioral therapy and psychoeducation aimed at enhancing psychological resilience and social resources. For male patients, interventions may directly address the disease itself, with a focus on providing clear information regarding clinical severity to help manage expectations.

Studies have indicated that young adults (aged 18–35) experience a heightened sense of stigma, which aligns with the findings of Wu et al regarding the stigma experienced by stroke patients.³⁹ This age group typically represents a critical period for career establishment, partner seeking, and social identity formation. The appearance changes associated with TAO may significantly threaten patients' social interactions, career advancement, and the development of intimate relationships. Consequently, this can lead to considerable psychological distress, positioning this demographic as an independent high-risk marker.

Similarly, patients with lower educational levels tend to experience a heightened sense of stigma, which aligns with the findings of Mollaoğlu regarding stigma in epilepsy patients.⁴⁰ Individuals with limited education may encounter greater difficulties in comprehending complex medical information, effectively communicating with healthcare professionals, and critically assessing social stigma. Consequently, they are more likely to internalize negative labels, and their capacity to access and utilize social and medical support resources is also relatively constrained.

Multivariate analysis results showed that patients with fewer than 5 ophthalmology visits within a year had lower stigma scores, which was consistent with the study results of Firmin.⁴¹ Frequent medical consultations may trigger concerns among patients regarding the visibility of their conditions and anxiety about others' perceptions, thereby internalizing their damaged social identity as patients and leading to a "cycle of heightened stigma". Furthermore, the results demonstrated that patients with milder grades of TAO experienced lower stigma. This is likely due to the less severe clinical symptoms, reduced impact on visual function and quality of life, and consequently, diminished psychological burden. In view of the above findings, it is recommended that medical staff pay more attention to young female TAO patients who have visited ophthalmology more frequently within one year, have a higher TAO grading and a lower educational level in clinical practice. Strengthened screening and early identification, along with timely psychosocial interventions, should be implemented for this population.

Impact of Coping Styles on the Stigma of TAO Patients

The results of this study indicate that higher scores for resignation coping among TAO patients are associated with increased levels of stigma, a finding consistent with previous research.¹⁸ Resignation coping style is essentially a maladaptive psychological pattern driven by self-blaming cognition and characterized by avoidance. Patients who adopt this pattern attribute their illness to themselves and consequently withdraw from social interactions to avoid anticipated humiliation. While such behavior may mitigate short-term social risks, it ultimately blocks opportunities to gain support through positive engagement and to challenge stigmatized perceptions, thereby reinforcing and deepening internalized shame over time. Accordingly, it is recommended that healthcare providers offer clinical psychological support to help patients reframe their perception of the illness—guiding them to understand that the condition results from multiple interacting factors rather than personal failure or punishment. Patients should be encouraged to gradually resume social activities in safe environments, reducing reliance on negative coping driven by anticipatory fear. Furthermore, psychosocial support for both patients and their families should be strengthened to enhance self-efficacy,⁴² promote active participation in treatment and self-management, and foster positive responsive behaviors, thereby mitigating the development of stigma.

Impact of Emotional Distress on the Stigma of TAO Patients

The results of this study demonstrate that higher emotional distress scores are associated with greater levels of stigma among TAO patients—a finding consistent with prior research.^{22,23} TAO patients experiencing depression and anxiety often become emotionally vulnerable and inwardly sensitive. Alterations in facial appearance frequently lead to feelings of inferiority in social contexts, resulting in progressive social withdrawal. Moreover, these individuals often isolate themselves and avoid discussing their condition with relatives and friends, which significantly weakens their social support networks. Trapped in cycles of self-blame and avoidance, patients struggle to alleviate disease-related shame, thereby reinforcing a vicious cycle of stigma. Research has shown that robust social support and family caring can effectively mitigate stigma.⁴³ Therefore, medical professionals can facilitate group psychological counseling for TAO patients to assist them in mastering emotional regulation strategies. Concurrently, patients can be assisted to carry out body image rehabilitation training and guided to learn appearance management skills, such as selecting appropriate eyewear, to promote the reconstruction of a positive self-image. Furthermore, it is recommended to establish a stable peer support network by creating mutual aid groups for patients. This initiative aims to enhance group identity through emotional support and experience sharing while collaboratively addressing the potential issue of social isolation. In addition, a significant finding of this study is the absence of a statistically significant correlation between stigma and thyroid function status in TAO patients. This suggests that the factors influencing stigma may be more closely related to the visibility and experience of the disease rather than to intrinsic biochemical indicators.

The primary clinical significance of this study lies in the recommendation to incorporate stigma screening into the routine ophthalmic outpatient assessment for patients with TAO. Early identification of high-risk individuals, such as women and those presenting with severe conditions, followed by their referral to mental health centers for essential psychological support and intervention, is a critical step in preventing the exacerbation of stigma. However, it is important to acknowledge that the cross-sectional design of this study precludes causal inference. While we observed significant associations among stigma, resignation coping, and emotional distress, the directionality of these relationships cannot be determined. A mutually reinforcing cycle likely exists between these factors. Future research should prioritize longitudinal, multi-center, and interventional studies to evaluate the efficacy of interventions such as group counseling and peer support. Furthermore, in this study, the internal reliability of the avoidance dimension of the MCMQ was moderate, which may reflect item heterogeneity or limited cultural adaptation. Consequently, the observed association between avoidance coping and stigma might have been underestimated. It is recommended that subsequent studies employ tools with enhanced established reliability and validity, or localize and validate existing instruments, to more accurately assess avoidance coping strategies of TAO patients.

Limitations

This study has several limitations. Firstly, participants were recruited from the ophthalmology department of a single hospital, which may introduce selection bias due to the convenience sampling method employed. This limitation restricts the generalizability of our findings. Secondly, laboratory indicators related to thyroid function, such as hormone levels and antibody concentrations, were not assessed in this study. This omission constrains our ability to explore the relationship between biomedical factors and psychosocial outcomes comprehensively. Additionally, emotional distress and coping variables were measured using self-report scales, which are susceptible to social desirability bias and recall bias; these factors may contribute to measurement errors. Furthermore, the sample size in the male patient subgroup was relatively small, resulting in insufficient statistical power. Therefore, in the future, thyroid function and treatment data should be prospectively collected and a multi-center longitudinal survey should be conducted. On this basis, qualitative research should be combined to gain a deeper understanding of the individual experience and change trajectory of TAO patients' stigma.

Conclusion

This study demonstrates that stigma among TAO patients in China is influenced by gender, age, educational level, frequency of medical visits, disease severity, coping styles, and emotional distress. Integrating psychosocial screening

and resilience-based interventions within ophthalmologic care could reduce perceived stigma and improve quality of life. Multi-center, longitudinal research is warranted to validate these findings.

Data Sharing Statement

The data supporting this study's findings are available from the corresponding author, Jie Ren, upon reasonable request.

Ethical Approval

This research conformed to the Declaration of Helsinki and received approval from the Biomedical Ethics Review Committee of West China Hospital of Sichuan University, with an ethics review number of 2024 (Review No.533). Before the questionnaire survey began, the investigator obtained informed consent from the respondents and assured them that the information collected would be used solely for the research study and not for any other purpose. For participants who are severely troubled by the HEI score indication, researchers will provide them with immediate and necessary psychological support based on the assessment results. For participants who require further professional intervention, after obtaining their informed consent, assist them in being referred to the psychiatry or clinical psychology department of our hospital for formal treatment.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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