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ORIGINAL RESEARCH

Knowledge, Attitudes, and Practices of Caregivers of Children with Tic Disorders Regarding the Traditional Chinese Medicine Diagnosis and Treatment of the Condition

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Introduction: This study aimed to investigate the knowledge, attitudes, and practices of caregivers of children with tic disorders regarding the Traditional Chinese Medicine (TCM) diagnosis and treatment of the condition.

Methods: A cross-sectional survey was conducted at Wuhan Children's Hospital from 1 October 2024 to 1 September 2025 using an online questionnaire that included demographic characteristics and three KAP dimensions. Caregivers referred to family members, such as parents or grandparents, who were primarily responsible for the child's daily care and health management. A score of at least 70% of the maximum possible score in each dimension was considered indicative of adequate knowledge, positive attitudes, or proactive practices.

Results: A total of 509 respondents participated in the study. The majority were aged between 18 and 40 years, married, and employed. Based on the 70% cut-off criterion, caregivers demonstrated insufficient knowledge, moderately positive attitudes, and suboptimal practices regarding TCM-related management of tic disorders. The mean scores for knowledge, attitudes, and practices were 8.68 (range 0–24), 28.02 (range 8–40), and 36.16 (range 11–55), respectively. Significant positive correlations were identified between knowledge and attitude ($r = 0.422$), knowledge and practice ($r = 0.564$), and attitude and practice ($r = 0.476$), with all correlations being statistically significant ($P < 0.001$). Path analysis revealed direct effects of knowledge on attitude ($\beta = 0.496$) and practice ($\beta = 0.294$), as well as the effect of attitude on practice ($\beta = 0.336$). Multivariate logistic regression indicated that higher knowledge (odds ratio [OR] = 1.902) and more positive attitudes (OR = 3.866) were independently associated with proactive practice, while a monthly income between 5000 and 10000 RMB and a history of smoking were associated with less proactive practice.

Conclusion: Caregivers exhibited insufficient knowledge, moderately positive attitudes, and inadequate practices regarding TCM-related management of tic disorders. Enhancing caregiver education may foster greater engagement and improve integrative care approaches. Future clinical programs should integrate structured health education and practical guidance to support informed and sustained participation from caregivers.

Keywords: tic disorders, Traditional Chinese Medicine, caregivers, knowledge, attitudes, health practices, cross-sectional studies

Introduction

Tic disorders (TD) are common pediatric neurodevelopmental conditions characterized by involuntary, sudden, and repetitive motor and vocal tics.[1] Tourette syndrome (TS), one of the most clinically complex subtypes of tic disorders, affects approximately 1% of children worldwide, although prevalence estimates may vary according to diagnostic criteria, symptom recognition, and access to healthcare. In China, nationwide epidemiological evidence indicates a similarly high burden, with about 2–3% of school-aged children meeting diagnostic criteria for TD.[2] Comorbid conditions, particularly attention-deficit/hyperactivity disorder (ADHD) and obsessive–compulsive disorder (OCD), are

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frequently observed and often exacerbate functional impairment.[3] The chronic, fluctuating course of TD can negatively affect academic performance, social development, and emotional well-being, while caregivers commonly report substantial stress associated with long-term management.[4] Although dopamine-blocking drugs and behavioral therapy remain core Western medical treatments, adverse effects and poor long-term adherence highlight the need for complementary therapeutic approaches.[5,6]

Within Traditional Chinese Medicine (TCM), TD is typically conceptualized as a manifestation of internal "wind," often associated with patterns such as "liver wind stirring internally".[7] TCM emphasizes holistic regulation and syndrome differentiation, providing individualized treatment strategies through herbal medicine, acupuncture, and pediatric Tui Na.[8,9] In Chinese clinical practice, integrative approaches combining Western medicine and TCM have become increasingly common, and several studies report that integrative therapy may reduce tic severity with fewer side effects than Western treatment alone.[8,10] Given the chronic nature of TD and the need for sustained management, caregiver participation (eg., in coordinating treatment and follow-up) is widely considered essential to adherence and contributes to improved long-term outcomes.[11]

Knowledge, Attitude, and Practice (KAP) surveys offer a structured method for assessing how specific populations understand health conditions and how their perceptions influence behaviors.[12] By systematically examining what individuals know, how they feel, and how they act, KAP frameworks help identify knowledge deficiencies, attitudinal barriers, and behavioral patterns that may hinder effective disease management or the adoption of evidence-based interventions.[13] In the context of TD, a KAP approach can clarify caregivers' understanding of TD and TCM-related concepts, their attitudes toward TCM therapies, and their actual practices in supporting integrative care. However, existing studies on tic disorders and TCM-related management largely focus on clinical efficacy, treatment outcomes, or biomedical mechanisms, while relatively fewer studies specifically examine caregivers' knowledge, attitudes, and practices regarding TCM-based management15,16. Although caregiver perspectives are widely represented in pediatric tic disorder research and provide valuable insights into children's daily management and treatment experiences, research specifically exploring caregivers' understanding and engagement with TCM-related care remains limited.[14,15] Preliminary findings indicate insufficient public awareness of TS and common misconceptions that may delay care or hinder consistent treatment engagement.[16] To date, no published studies have examined caregivers' KAP regarding TCM-based management of TD, revealing a significant research gap.

This study aims to evaluate the knowledge, attitudes, and practices of caregivers of children with tic disorder in relation to TCM-based diagnosis and treatment.

Materials and Methods

Study Design and Participants

This cross-sectional survey was conducted at Wuhan Children's Hospital from 1 October 2024 to 1 September 2025. The study population comprised primary caregivers of children diagnosed with tic disorders, including parents, grandparents, or other family members who were primarily responsible for the child's daily care and health management. Eligible caregivers co-resided with the child, had provided caregiving for at least six months, and were responsible for providing at least four hours of daily care specifically for the child with tic disorder. The study protocol was approved by the Medical Ethics Committee of Wuhan Children's Hospital (Approval No. 2024R110-E01), and informed consent was obtained from all participants. All procedures were conducted in accordance with the Declaration of Helsinki. Inclusion criteria comprised the following: 1) children who fulfilled the diagnostic criteria for tic disorders as delineated in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5); 2) caregivers aged 18 years or older; and 3) the ability to independently complete the questionnaires. Exclusion criteria included: 1) the presence of cognitive impairment or a mental disorder that hindered the completion of the questionnaire; and 2) withdrawal from the study for any reason.

Questionnaire

The questionnaire was developed with reference to the Expert Consensus on Traditional Chinese Medicine Diagnosis and Treatment of Pediatric Tic Disorder.[17] A pilot test involving 30 respondents was conducted before the formal survey, yielding a Cronbach's α of 0.828. According to previous methodological studies, a Cronbach's α coefficient of ≥0.70 generally indicates acceptable internal consistency.[18] The finalized instrument comprised four sections: demographic and socioeconomic characteristics (including gender, age, education level, employment status, monthly income, marital status, smoking and drinking habits), and the knowledge, attitude, and practice dimensions. The knowledge dimension contained eight questions encompassing twelve items, with response options of "very familiar," "heard of it," and "unclear," scored as 2, 1, and 0 points, respectively, for a total possible score of 0–24. The attitude dimension consisted of eight questions rated on a five-point Likert scale ranging from "very positive" (5 points) to "very negative" (1 point), yielding a total score of 8–40. The practice dimension included eleven items, also assessed on a five-point Likert scale from "always" (5 points) to "never" (1 point), with total scores ranging from 11 to 55.

Questionnaire Distribution and Quality Control

When children visited the hospital, researchers conducted on-site surveys with their primary caregivers. Unified instructions and explanations were provided to all participants before administering the electronic questionnaire. Prior to data collection, all investigators received standardized training to ensure familiarity with the questionnaire content and survey procedures. The research team consisted of eight members, including one Traditional Chinese Medicine physician responsible for reviewing the questionnaire content, four nurses responsible for questionnaire distribution and data collection, two supervising nurses responsible for data management and statistical preparation, and one head nurse responsible for overall supervision and quality control throughout the study process.

The online questionnaire was designed with logical skip patterns and mandatory fields to ensure data completeness and accuracy. Before completing the questionnaire, participants were reminded to answer carefully and truthfully. Predefined exclusion criteria for invalid questionnaires included a completion time of less than 60 seconds, logical inconsistencies in responses (for example, simultaneously selecting a specific medical insurance type and "no insurance"), and repeated response patterns such as selecting the same option across all KAP items. These quality-control procedures helped reduce missing or invalid data and contributed to the high questionnaire completion and validity rates observed in the present study. After completion of data collection and prior to formal statistical analysis, the research team reviewed the questionnaire data for potential anomalies and logical inconsistencies. The data were then entered into the statistical software using a double-entry method and subjected to additional logical consistency checks to further ensure data quality.

Statistical Analysis

Data analysis was conducted using SPSS 27.0 (IBM, Armonk, NY, USA), and structural modeling procedures were performed in AMOS 26.0 (IBM, Armonk, NY, USA). Continuous variables are presented as means and standard deviations (SD), whereas categorical variables are summarized as n (%). All continuous variables were first assessed for normality. For comparisons between two groups, the independent-samples *t*-test was applied when data met the assumptions of normality, while the Wilcoxon Mann–Whitney test was used for non-normally distributed variables. For comparisons across three or more groups, analysis of variance (ANOVA) was used when both normality and homogeneity of variance were satisfied; otherwise, the Kruskal–Wallis test was employed. Multivariate logistic regression analysis was conducted to identify factors independently associated with proactive practice, using 70% of the maximum possible practice score as the cut-off threshold for proactive practice. To further evaluate the structural relationships among KAP and selected demographic variables, path analysis was performed using structural equation modeling. A two-sided P-value of less than 0.05 was considered indicative of statistical significance.

Patient and Public Involvement Statement

This study did not include patient or public involvement in its design, conduct, or reporting.

Results

A total of 510 questionnaires were collected. One response from a participant under the age of 18 was excluded. No other questionnaires met the predefined exclusion criteria for invalid responses, including excessively short completion time, logical inconsistencies, or repeated response patterns. Ultimately, 509 valid questionnaires remained, with a valid response rate of 99.80%, indicating a high questionnaire completion and response validity rate.

Demographic Information on Participants

This study included 509 family members of children with tic disorders, with a balanced gender distribution (51.1% female) and predominantly young to middle-aged participants (62.5% aged 18–40 years). Most respondents held associate or bachelor's degrees (63.5%), were married (82.5%), and employed (75.6%). Income distribution showed that 46.6% reported monthly incomes between 5000–10000 RMB. Clinically, 57.2% of the affected children had been diagnosed for less than one year, and approximately half of the families (49.5%) had experience with TCM treatment for the condition. Their mean knowledge, attitude, and practice scores were 8.68±6.13 (possible range: 0–24), 28.02±4.13 (possible range: 8–40), and 36.16±8.81 (possible range: 11–55), respectively. Based on the predefined 70% cut-off criterion, these findings indicated insufficient knowledge, moderately positive attitudes, and suboptimal practices regarding TCM-related management of tic disorders. Knowledge scores differed significantly by gender, education level, age, employment status, monthly income, marital status, smoking and drinking habits, duration since diagnosis, and TCM treatment experience (all $P < 0.05$). Attitude scores varied significantly with gender, education level, age, employment status, monthly income, marital status, smoking habit, and TCM treatment experience (all $P < 0.05$). Practice scores showed significant associations with gender, education level, age, employment status, monthly income, marital status, smoking and drinking habits, duration since diagnosis, and TCM treatment experience (all $P < 0.05$) (Table 1).

Table 1 Demographic Characteristics and KAP Scores

	N (%)	Knowledge, Mean± SD	P	Attitude, Mean± SD	P	Practice, Mean± SD	P
Total score		8.68±6.13		28.02±4.13		36.16±8.81	
Gender			<0.001		<0.001		<0.001
Male	249(48.92%)	7.10±5.41		26.96±4.30		34.39±8.58	
Female	260(51.08%)	10.18±6.40		29.04±3.70		37.85±8.71	
Education			<0.001		<0.001		<0.001
Senior high school or below	102(20.04%)	4.25±4.41		27.10±3.34		33.08±4.87	
Associate/ Bachelor's degree	323(63.46%)	10.98±5.87		28.81±4.55		37.39±9.74	
Master's degree or above	45(8.84%)	5.44±2.90		26.73±1.92		31.64±5.17	
Unknown	39(7.66%)	4.92±4.97		25.44±1.68		39.23±8.26	
Age			<0.001		0.037		<0.001
18–40	318(62.48%)	9.92±6.51		28.32±4.53		37.38±9.14	
41–50	191(37.52%)	6.61±4.79		27.53±3.33		34.12±7.83	
Employment status			<0.001		0.033		<0.001
Employed	385(75.64%)	9.81±6.03		27.85±4.32		38.02±8.09	
Other	124(24.36%)	5.17±5.03		28.56±3.44		30.36±8.46	
Monthly income per capita			0.003		<0.001		<0.001
<5000	113(22.20%)	6.77±4.05		26.63±2.49		33.31±9.13	
5000–10,000	237(46.56%)	9.38±7.43		29.27±4.59		38.25±7.79	
>10,000	122(23.97%)	9.02±4.34		27.93±2.77		36.93±6.14	
Prefer not to disclose	37(7.27%)	8.81±6.24		24.65±5.50		28.86±14.17	
Marital status			0.022		<0.001		<0.001
Married	420(82.51%)	8.97±6.38		28.43±4.06		37.01±8.10	
Other	89(17.49%)	7.30±4.52		26.10±3.96		32.13±10.76	

(*Continued*)

Table 1 (Continued).

	N (%)	Knowledge, Mean± SD	P	Attitude, Mean± SD	P	Practice, Mean± SD	P
Smoking habit			0.001		<0.001		<0.001
Never	313(61.49%)	9.11±6.43		28.68±3.70		37.61±9.26	
Former	50(9.82%)	5.68±3.98		28.24±3.56		31.68±5.89	
Currently smoke	146(29.67%)	8.78±5.82		26.53±4.80		34.58±7.86	
Drinking habit			<0.001		0.200		<0.001
Never	290(56.97%)	9.93±6.28		27.94±4.35		37.21±8.78	
Former	68(13.36%)	9.44±4.41		28.75±4.23		32.09±8.25	
Currently drink	151(29.67%)	5.92±5.62		27.85±3.63		35.96±8.61	
Duration of family member been diagnosed with tic disorder			<0.001		0.395		0.002
<1 year	291(57.17%)	6.85±5.54		28.13±3.71		35.18±8.90	
1~5 years	218(42.83%)	11.12±6.04		27.88±4.65		37.47±8.54	
Received TCM treatment			<0.001		<0.001		<0.001
Yes	252(49.51%)	10.32±6.85		29.80±4.17		38.60±8.41	
No	257(50.49%)	7.07±4.82		26.28±3.28		33.77±8.55	

Distribution of Responses to Knowledge, Attitude, and Practice

The distribution of responses within the knowledge section of the questionnaire revealed that the detailed understanding of tic disorder subtypes was notably limited, with over 50% of respondents being unfamiliar with the diagnostic criteria for transient tic disorder (K3.3, 53.24%) and chronic tic disorder (K3.5, 50.29%). Knowledge of TCM-specific interventions was particularly deficient, as 49.12% were not familiar with pediatric massage as a primary therapy for preschool children (K5), and 51.87% lacked awareness of combined TCM and Western medicine approaches for school-age children (K6). Additionally, 55.21% of participants were unaware of recommendations that children with tic disorders should avoid overly intense or confrontational physical activities during periods of symptom fluctuation and gradually resume exercise after symptom stabilization (K7), as suggested in the Expert Consensus on Traditional Chinese Medicine Diagnosis and Treatment of Pediatric Tic Disorder18 (Table 2).

Responses within the attitude section of the questionnaire showed that 8.84% strongly agreed and 34.18% agreed that hospitals lack sufficient popular science education and health promotion regarding TCM treatment for pediatric tic disorders (A4), while 4.32% strongly agreed and 28.29% agreed that TCM treatment for pediatric tic disorders has a slow onset of effect (A6). Regarding the confidence in the safety of TCM treatment for pediatric tic disorders (K2), 42.44% were neutral (Table 3).

Responses within the practice section of the questionnaire showed that only 2.55% always shared their experience of their child's tic disorder treatment with other parents (P5), only 4.72% always encouraged their child to engage in at least 60 minutes of moderate-intensity physical activity each day (P10), and only 6.48% always recommended TCM treatment when encountering other children with similar symptoms (P8) (Table 4).

Correlations Between KAP

In the correlation analysis, significant positive correlations were found between knowledge and attitude ($r = 0.422$, $P < 0.001$), knowledge and practice ($r = 0.564$, $P < 0.001$), as well as attitude and practice ($r = 0.476$, $P < 0.001$), respectively (Table 5).

Interactions Between KAP

The path model demonstrates a favorable fit indices (CMIN/DF value: 3.183, RMSEA value: 0.066, IFI value: 0.970, TLI value: 0.928, and CFI value: 0.969), suggesting a well-fitting model (Supplementary Table 1). The path analysis revealed

Table 2 Distribution of Knowledge Section Responses

	N (%)		
	Very Familiar	**Heard of It**	**Not Familiar**
1. Tic disorder is a relatively common and complex chronic neuropsychiatric disorder occurring during childhood or adolescence.	39(7.66%)	334(65.62%)	136(26.72%)
2. The main manifestations of tic disorder are involuntary, repetitive, sudden, rapid, repetitive, and nonrhythmic motor tics involving one or more muscle groups and/or vocal tics. Symptoms tend to worsen with anxiety or excitement and lessen during relaxation.	65(12.77%)	327(64.24%)	117(22.99%)
3.1 Combined vocal and multiple motor tic disorder (also known as Tourette syndrome): characterized by multiple motor tics and one or more vocal tics that occur simultaneously.	38(7.47%)	289(56.78%)	182(35.76%)
3.2 Tourette syndrome: tics occur several times a day, either daily or intermittently, with a disease course lasting more than one year; however, symptom-free periods within a year do not exceed two consecutive months.	25(4.91%)	248(48.72%)	236(46.37%)
3.3 Transient tic disorder: characterized by single or multiple motor or vocal tics that occur several times per day, persisting for more than two weeks but not exceeding twelve months.	26(5.11%)	212(41.65%)	271(53.24%)
3.4 Chronic tic disorder: primarily presents with either motor or vocal tics, but not both simultaneously.	37(7.27%)	250(49.12%)	222(43.61%)
3.5 Chronic tic disorder: tics occur multiple times a day, either daily or intermittently, with a disease course often exceeding one year; symptom-free periods within a year do not exceed two consecutive months.	24(4.72%)	229(44.99%)	256(50.29%)
4. Increased tension, anxiety, or psychological stress in children may trigger tic disorders as a stress response.	152(29.86%)	259(50.88%)	98(19.25%)
5. Preschool children: TCM treatment should primarily begin with pediatric massage therapy (Tui Na), which may be combined with auricular acupressure or acupoint application therapy.	66(12.97%)	193(37.92%)	250(49.12%)
6. School-age children: TCM internal and external therapies may be used in combination; for refractory cases, integrated Traditional Chinese and Western medicine treatment is recommended.	668(13.36%)	177(34.77%)	264(51.87%)
7. During symptom fluctuation periods, children should avoid overly intense or confrontational physical activities. Once tic symptoms have remained stable for more than two months, the intensity of exercise may be gradually increased.	36(7.07%)	192(37.72%)	281(55.21%)
8. Children should maintain a pleasant and stable mood to prevent emotional fluctuations that could cause symptom recurrence. Avoid excessive mental stress or punishment; instead, emphasize positive guidance and encouragement. Family conflicts or domestic violence should be avoided.	158(31.04%)	238(46.76%)	113(22.20%)

several significant pathways in the KAP model (Figure 1). Regarding direct effects, knowledge directly affected attitude (β = 0.496, P = 0.012) and practice (β = 0.294, P = 0.020), while attitude directly affected practice (β = 0.336, P = 0.012). Receiving Traditional Chinese Medicine treatment directly affected knowledge (β = −0.198, P = 0.015) and attitude (β = −0.424, P = 0.006). Alcohol consumption directly affected knowledge (β = −0.277, P = 0.010). Duration since tic disorder diagnosis in the child directly affected knowledge (β = 0.296, P = 0.008) and attitude (β = −0.278, P = 0.007). Employment status directly affected knowledge (β = −0.191, P = 0.006), attitude (β = 0.311, P = 0.014), and practice (β = −0.316, P = 0.014). For indirect effects, knowledge indirectly affected practice (β = 0.167, P = 0.007). Receiving Traditional Chinese Medicine treatment indirectly affected attitude (β = −0.098, P = 0.020) and practice (β = −0.234, P = 0.005). Alcohol consumption indirectly affected attitude (β = −0.137, P = 0.009) and practice (β = −0.127, P = 0.009). Duration since tic disorder diagnosis in the child indirectly affected attitude (β = 0.147, P = 0.008). Employment status indirectly affected attitude (β = −0.095, P = 0.007) (Table 6).

Table 3 Distribution of Attitude Section Responses

	N (%)				
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Never**
1. You believe that TCM has unique advantages in treating pediatric tic disorders.	84(16.50%)	218(42.83%)	196(38.51%)	11(2.16%)	0
2. You have great confidence in the safety of TCM treatment for pediatric tic disorders.	99(19.45%)	183(35.95%)	216(42.44%)	11(2.16%)	0
3. You have great confidence in the effectiveness of TCM in improving the symptoms of pediatric tic disorders.	103(20.24%)	196(38.51%)	199(39.10%)	11(2.16%)	0
4. You believe that hospitals lack sufficient popular science education and health promotion regarding TCM treatment for pediatric tic disorders.	45(8.84%)	174(34.18%)	231(45.38%)	59(11.59%)	0
5. You have great confidence that TCM treatment can improve the psychological well-being of children with tic disorders.	77(15.13%)	255(50.10%)	177(34.77%)	0	0
6. You believe that TCM treatment for pediatric tic disorders has a slow onset of effect.	22(4.32%)	144(c%)	247(48.53%)	96(18.86%)	0
7. You believe that TCM treatment for pediatric tic disorders has few side effects.	0104(20.43%)	222(43.61%)	160(31.43%)	23(4.52%)	0
8. You have great confidence that TCM treatment can improve the quality of life of children with tic disorders.	076(14.93%)	252(49.51%)	170(33.40%)	11(2.16%)	0

Table 4 Distribution of Practice Section Responses

	N (%)				
	Always	**Often**	**Occasionally**	**Rarely**	**Never**
1. You actively learn about knowledge related to pediatric tic disorders.	36(7.07%)	119(23.38%)	198(38.90%)	133(26.13%)	23(4.52%)
2. You follow the doctor's advice and take your child for regular follow-up visits and treatments.	103(20.24%)	161(31.63%)	121(23.77%)	101(19.84%)	23(4.52%)
3. You pay attention to your child's dietary restrictions to cooperate with treatment.	61(11.98%)	230(45.19%)	111(21.81%)	96(18.86%)	11(2.16%)
4. You observe changes in your child's symptoms in order to adjust the treatment plan in a timely manner.	63(12.38%)	237(46.56%)	114(22.40%)	73(14.34%)	22(4.32%)
5. You share your experience of your child's tic disorder treatment with other parents.	13(2.55%)	199(39.10%)	78(15.32%)	143(28.09%)	76(14.93%)
6. You refer to tic disorder treatment guidelines and help your child develop good daily habits.	83(16.31%)	130(25.54%)	86(16.90%)	176(34.58%)	34(6.68%)
7. When your child develops tic symptoms, you first consider TCM treatment methods.	46(9.04%)	157(30.84%)	178(34.97%)	103(20.24%)	25(4.91%)
8. When encountering other children with similar symptoms, you recommend TCM treatment.	33(6.48%)	194(38.11%)	176(34.58%)	91(17.88%)	15(2.95%)
9. You ensure your child gets sufficient sleep, and pay attention to daily exercise, diet, mood, and psychological adjustment.	61(11.98%)	309(60.71%)	46(9.04%)	81(15.91%)	12(2.36%)
10. You encourage your child to engage in at least 60 minutes of moderate-intensity physical activity each day.	24(4.72%)	122(23.97%)	193(37.92%)	159(31.24%)	11(2.16%)
11. You maintain a fresh and comfortable environment in your child's bedroom, keep the temperature appropriate, ensure a quiet setting, and cultivate independent sleeping habits.	509(21.41%)	226(44.40%)	104(20.43%)	59(11.59%)	11(2.16%)

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Table 5 Correlation Analysis

	Knowledge	Attitude	Practice
Knowledge	1		
Attitude	0.422(P<0.001)	1	
Practice	0.564(P<0.001)	0.476(P<0.001)	1

Factors Associated with Practice

Seventy percent of the total score for the practice section of the questionnaire was used as the cut-off value to classify practice levels, and 292 participants scored below this threshold. Multivariate logistic regression showed that higher knowledge scores (OR = 1.902, 95% CI: [1.352–2.676], P < 0.001), more positive attitude scores (OR = 3.866, 95% CI: [2.146–6.963], P < 0.001), being employed (OR = 3243.619, 95% CI: [56.299–186,879.230], P < 0.001), and current alcohol consumption (OR = 307.335, 95% CI: [3.107–30,404.718], P = 0.015) were independently associated with proactive practice. However, a monthly income per capita of 5000–10000 Yuan (OR = 0.003, 95% CI: [0.000–0.098], P = 0.001) and a former smoking habit (OR = 0.000, 95% CI: [0.000–0.001], P < 0.001) were independently associated with lower likelihood of achieving proactive practice scores based on the predefined 70% cut-off criterion (Table 7).

Discussion

Based on the predefined cut-off criterion of 70% of the maximum possible score for each KAP section, caregivers of children with tic disorders demonstrated insufficient knowledge and suboptimal practices regarding TCM-related

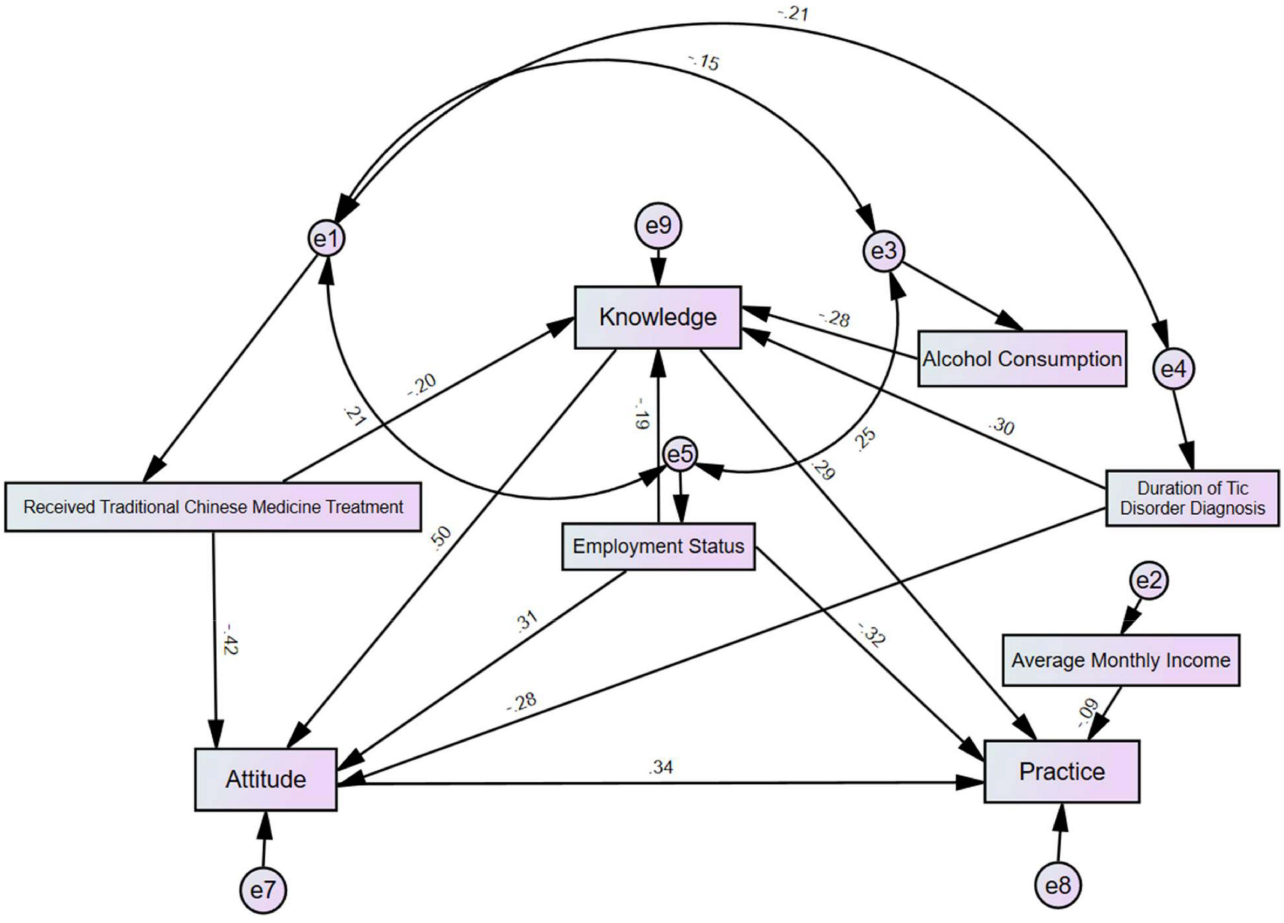

Figure 1 Path analysis.

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Table 6 Path Analysis

Model Paths	Standardized Total Effects (95% CI)	P	Standardized Direct Effects (95% CI)	P	Standardized Indirect Effects (95% CI)	P
Knowledge→Attitude	0.496(0.419–0.561)	0.016	0.496(0.338–0.486)	0.012		
Knowledge→Practice	0.460(0.401–0.546)	0.009	0.294(0.439–0.594)	0.020	0.167(0.067–0.158)	0.007
Attitude→Practice	0.336(0.238–0.426)	0.014	0.336(0.152–0.375)	0.012		
Received Traditional Chinese Medicine Treatment→Knowledge	−0.198(−0.267– −0.120)	0.015	−0.198(−0.267- −0.102)	0.015		
Received Traditional Chinese Medicine Treatment→Attitude	−0.523(−0.577- −0.468)	0.007	−0.424(−0.487- −0.371)	0.006	−0.098(−0.133- −0.046)	0.020
Received Traditional Chinese Medicine Treatment→Practice	−0.231(−0.292- −0.184)	0.005			−0.234(−0.292- −0.184)	0.005
Alcohol Consumption→Knowledge	−0.277(−0.350- −0.197)	0.010	−0.277(−0.350- −0.197)	0.010		
Alcohol Consumption→Attitude	−0.137(−0.177- −0.100)	0.009			−0.137(−0.177- −0.100)	0.009
Alcohol Consumption→Practice	−0.127(−0.163- −0.092)	0.009			−0.127(−0.163- −0.092)	0.009
Duration of Tic Disorder Diagnosis in Family Member→Knowledge	0.296(0.211–0.391)	0.008	0.296(0.211–0.391)	0.008		
Duration of Tic Disorder Diagnosis in Family Member→Attitude	−0.131(−0.211- −0.049)	0.007	−0.278(−0.339- −0.214)	0.007	0.147(0.102–0.209)	0.008
Duration of Tic Disorder Diagnosis in Family Member→Practice	0.043(−0.020–0.114)	0.126			0.043(−0.020–0.114)	0.126
Employment Status→Knowledge	−0.191(−0.270- −0.132)	0.006	−0.191(−0.270- −0.132)	0.006		
Employment Status→Attitude	0.216(0.155–0.270)	0.012	0.311(0.236–0.372)	0.014	−0.095(−0.143- −0.063)	0.007
Employment Status→Practice	−0.300(−0.399- −0.219)	0.008	−0.316(−0.383– −0.232)	0.014	0.016(−0.037–0.072)	0.595
Average Monthly Income→Practice	−0.092(−0.184–0.015)	0.062	−0.092(−0.184–0.015)	0.062		

Table 7 Univariate and Multivariate Analysis for Practice Dimension

	Univariate Logistic Regression		Multivariate Logistic Regression	
	OR (95% CI)	P	OR (95% CI)	P
Knowledge dimension	1.319(1.257–1.386)	<0.001	1.902(1.352–2.676)	<0.001
Attitude dimension	1.403(1.319–1.493)	<0.001	3.866(2.146–6.963)	<0.001
Gender				
Male	0.411(0.286–0.590)	<0.001	3.559(0.300–42.221)	0.314
Female	Ref		Ref	
Education				
Senior high school or below	2.773(1.886–4.077)	<0.001	0.463(0.032–6.628)	0.571
Associate/ Bachelor's degree	Ref		Ref	
Master's degree or above				
Unknown	Ref		Ref	
Age	30.455(10.943–84.760)	<0.001	2.305(0.090–58.748)	0.613
18–40	7.926(2.366–26.556)	<0.001	0.126(0.002–6.988)	0.312
41–50	35.219(10.757–115.309)	<0.001	–	–
Employment status				
Employed	6.804(3.928–11.787)	<0.001	3243.619(56.299–186,879.230)	<0.001
Other	Ref		Ref	
Monthly income per capita				
<5000	Ref		Ref	
5000–10,000	4.441(0.902–2.300)	0.126	0.003(0.000–0.098)	0.001

(*Continued*)

Table 7 (Continued).

	Univariate Logistic Regression		Multivariate Logistic Regression	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**
>10,000	2.251(1.327–3.816)	0.003	5.962(0.159–223.474)	0.334
Prefer not to disclose	1.201(0.556–2.596)	0.641	34.162(0.518–2253.386)	0.099
Marital status				
Married	2.463(1.476–4.110)	<0.001	0.713(0.092–5.533)	0.746
Other	Ref		Ref	
Smoking habit				
Never	Ref		Ref	
Former	0.019(0.003–0.138)	<0.001	0.000(0.000–0.001)	<0.001
Currently smoke	0.524(0.350–0.785)	0.002	0.005(0.000–1.176)	0.057
Drinking habit				
Never	Ref		Ref	
Former	0.336(0.187–0.604)	<0.001	0.137(0.006–2.905)	0.202
Currently drink	0.448(0.297–0.676)	<0.001	307.335(3.107–30,404.718)	0.015
Duration of family member been diagnosed with tic disorder				
<1 year	Ref		Ref	
1~5 years	2.069(1.445–2.962)	<0.001	0.849(0.015–48.416)	0.937
Received TCM treatment				
Yes	3.133(2.171–4.519)	<0.001	0.092(0.002–4.276)	0.223
No	Ref		Ref	

management, despite generally positive attitudes toward TCM. Specifically, many caregivers expressed confidence in the safety, effectiveness, and quality-of-life benefits of TCM-based interventions, while simultaneously demonstrating limited understanding of TCM syndrome differentiation, treatment selection, and exercise-related recommendations. This discrepancy may reflect the widespread cultural acceptance and general trust in TCM within China, even among individuals who have not received systematic education regarding specific TCM management strategies for tic disorders. In addition, caregivers may develop favorable attitudes through previous exposure to family traditions, social media, hospital promotion materials, or anecdotal treatment experiences, despite lacking detailed clinical knowledge. These findings suggest that positive attitudes alone may not be sufficient to support effective disease-management behaviors without adequate practical understanding and structured guidance. Higher knowledge scores and more positive attitudes were significantly associated with more proactive engagement in TCM-related management behaviors, including follow-up adherence, symptom monitoring, lifestyle regulation, and treatment cooperation. Therefore, structured and evidence-informed caregiver education programs may help bridge the gap between general acceptance of TCM and the implementation of informed, sustainable, and guideline-consistent management practices.

The positive correlations among knowledge, attitudes, and practices, together with the structural equation model, align with patterns observed in previous KAP studies involving chronic neurological, infectious, and long-term health-management conditions, where knowledge may exert both direct and indirect influences on health-related behaviors through attitudinal pathways. Related research suggests that caregivers managing Kawasaki disease, hand, foot and mouth disease, childhood epilepsy, or pediatric snoring often show parallel patterns, with higher knowledge and more favorable attitudes predicting more proactive health behaviors, even after adjustment for demographic factors.[17,19–21] In the context of tic disorders, previous clinical and service-related research has shown that families are often exposed to fragmented health information, uncertainty regarding prognosis, and inconsistent guidance from healthcare professionals, which may weaken the translation of knowledge into effective disease-management behaviors.[22,23] The present KAP structure therefore appears to reflect a broader pattern in chronic-condition management: caregivers often operate within

an information environment characterized by partial understanding and limited systematic education, yet greater disease-related knowledge still appears to promote more proactive caregiving behaviors, such as treatment adherence, symptom monitoring, health-information seeking, and engagement in TCM-related management strategies.

The knowledge dimension disclosed a notably limited familiarity with diagnostic subtypes, TCM syndrome differentiation, and recommendations concerning exercise and lifestyle regulation. An additional significant finding pertains to the observation that caregivers with prior TCM treatment experience exhibited lower levels of both knowledge and attitudes towards TCM. Several possible explanations may account for this finding. Caregivers with prior TCM treatment experience may have encountered outcomes that did not fully meet their expectations, insufficient explanations regarding treatment mechanisms or duration, or practical barriers such as cost, time burden, and complex treatment regimens. In addition, families seeking TCM treatment may include children with more persistent or complex symptoms, and prolonged disease management may lead caregivers to hold more cautious or skeptical perceptions of TCM effectiveness. Related research indicates that families of individuals with tic disorders, even when they access specialized services, frequently lack clarity regarding diagnostic categories and long-term disease trajectories, with many relying on informal explanations or non-professional sources to interpret symptoms.[22,23] This may contribute to delayed treatment decisions, inconsistent management strategies, and reduced confidence in evidence-based care recommendations.

Reviews of integrative TCM and Western approaches for tic disorders in children describe a rapidly expanding clinical repertoire, including herbal prescriptions, acupuncture, massage, and combined regimens, but also note that these protocols are complex and unevenly disseminated at the primary care level.[24,25] Evidence from clinical studies of pediatric massage, both as a standalone TCM modality and in combination with other TCM therapies, indicates that these interventions can reduce tic severity and adverse effects compared with conventional pharmacotherapy, yet caregiver awareness of such indications is often limited.[26,27] The restricted knowledge observed in this survey, especially regarding age-appropriate TCM regimens and integrative strategies, therefore appears consistent with broader gaps in family-facing dissemination of TCM guidance, despite a growing clinical evidence base.

Attitudes in this study were generally positive toward the potential benefits and safety of TCM, but a sizeable proportion of caregivers expressed reservations about onset of effect and expressed neutral views when judging safety or overall value. Related research suggests that caregivers frequently regard TCM as "gentler" or more acceptable for children, while simultaneously doubting its speed or reliability, especially when symptoms are severe or socially disruptive.[24,28] Studies of Chinese patent medicines and standardized herbal formulas for tic disorders have documented improvements in tic scores with favorable safety profiles when compared with conventional antipsychotics, which may not be widely known among families.[28,29] Randomized trials of formulas such as Jingxin Zhidong and Shaomazhijing granules show that carefully structured TCM regimens can achieve clinically meaningful symptom control with tolerable adverse reactions, yet these details seldom feature in routine counselling.[29,30] The present attitudinal pattern, in which caregivers are broadly receptive but uncertain, likely reflects this asymmetry: professional circles may increasingly view TCM as an evidence-based component of integrative care, while families encounter a more fragmented mix of anecdote, advertising, and limited hospital-based education.

The findings indicate that many caregivers engage in basic supportive behaviors, such as attending follow-up visits and monitoring symptoms, but fewer report sustained efforts to seek specialized information, encourage structured physical activity, or share TCM-related experiences with other families. Research suggests that this gap between general caregiving tasks and condition-specific self-management is common in pediatric chronic disease: caregivers typically manage daily routines and appointments but often struggle with specialized behavioral recommendations, especially when these are not reinforced or clearly defined by clinicians.[17,19–21] In this study, the logistic regression showed that higher knowledge scores and more positive attitudes were strongly associated with proactive practice, even after accounting for sociodemographic factors, which mirrors KAP patterns observed in caregivers managing epilepsy, infectious diseases, and sleep-related problems.[19–21] The convergence of correlation, structural modelling, and regression results strengthens the inference that knowledge and attitudes are not merely markers of engagement but likely proximal levers that shape concrete practice in the TCM context.

The multivariate analyses also highlighted a series of demographic and behavioral correlates that interacted with KAP. In addition, the finding that caregivers with a master's degree or above demonstrated lower KAP scores than those

with an associate or bachelor's degree is also worth noting. One possible explanation supported by the present findings is that caregivers with higher educational attainment may rely more strongly on biomedical frameworks and therefore hold more critical or evidence-oriented views toward TCM, a pattern also reported in other integrative-medicine contexts where higher education is associated with stricter evidence expectations.[31,32] Individuals with advanced degrees may apply stricter self-assessment standards when rating their knowledge or confidence, leading to more conservative responses. The small size of this subgroup may also reflect diverse personal experiences or expectations toward TCM, warranting further research. Employment status, alcohol consumption, duration since diagnosis, and previous TCM treatment linked to knowledge, attitudes, or practices in the structural equation model, while income level and smoking history emerged as predictors in the logistic model. Research indicates that caregiver employment and income affect access to services and time for health information seeking and clinic attendance, with employed caregivers often managing competing demands but benefiting from higher health literacy and digital access.[19–21] Studies in other pediatric KAP contexts report that longer disease duration tends to increase knowledge but may also generate fatigue or skepticism when previous treatment attempts have been perceived as burdensome or ineffective.[20,21] Clinical trials of TCM preparations for tic disorders point to variable but generally favorable outcomes, yet qualitative reports indicate that families may remember treatment burden and out-of-pocket costs more readily than detailed efficacy parameters.[28,29,33] The finding that caregivers with previous TCM experience showed lower knowledge and attitude scores in the path model may therefore reflect a complex interplay between treatment expectations, prior experiences, and system-level factors such as access, cost, and communication quality. In addition, a history of smoking was associated with less proactive practice in the multivariate analysis. Although the underlying mechanism remains unclear, smoking behavior may partly reflect broader lifestyle and health-management patterns that influence caregivers' engagement in disease-related care behaviors. Previous studies in other health-related contexts have also suggested that smoking status may be associated with lower health awareness, reduced preventive health behaviors, and lower adherence to recommended management strategies.[34,35] Nevertheless, given the relatively small subgroup size, cross-sectional design, and extremely wide or boundary estimates for several covariates, these findings should be interpreted cautiously because they may reflect sparse-data effects or model instability and require further investigation.

The distribution of responses indicates several system-level challenges. Knowledge items related to everyday regulation of activity, mood, and family environment were more commonly recognized and understood by caregivers than items involving detailed diagnostic classifications or specialized TCM concepts. This suggests that general messages about stress reduction and emotional support are more widely understood than those about syndrome differentiation or integrative therapy selection. Research indicates that public health messaging often emphasizes generic lifestyle advice while reserving condition-specific or modality-specific guidance for specialized settings.[24,25] Attitude items pointing to perceived deficits in hospital-based popular science education on TCM align with reports that families frequently receive minimal structured information about non-pharmacological or integrative options during routine consultations for tic disorders.[22,23] On the practice side, low engagement in sharing experiences, recommending TCM to others, or encouraging regular physical activity suggests that caregivers may not feel confident enough in their own understanding to advocate for TCM-based strategies within peer or community networks. Similar patterns have been observed in caregiver KAP surveys on epilepsy and infectious diseases, where limited confidence and fragmented guidance reduce the likelihood that caregivers become active disseminators of health information.[19,20]

Taken together, these findings point first to the need for structural adjustments within pediatric neurology and TCM services. Hospitals and community clinics could integrate standardized, diagnosis-specific education pathways into routine care, with brief structured sessions at key time points such as diagnosis, initiation of TCM therapy, and major treatment changes. Related research suggests that caregiver-focused educational programs, when delivered through simple written materials, digital modules, and brief counselling, can raise KAP scores and improve adherence in pediatric conditions that require complex at-home management.[17,19–21] In the context of tic disorders, such programs might include concise illustrations of diagnostic categories, explanations of TCM treatment principles such as "internal wind" and syndrome differentiation, and practical guidance on how to monitor tics and adjust daily routines in coordination with clinicians.[24,25] Embedding these materials into both neurology and TCM departments, rather than leaving them to ad

hoc counselling, could reduce variability in information quality and ensure that families receive a coherent narrative about integrative care.

Educational interventions should be tailored to the specific deficits identified. Limited familiarity with TCM treatment strategies for different age groups indicates that caregivers would benefit from age-specific information packages, providing clear guidance on the appropriate use of massage, herbal therapy, acupuncture, or Chinese patent medicines. Research in integrative tic disorder management highlights the importance of dose, course length, and combination strategies when using herbal formulas, showing that parents often misunderstand these elements when not clearly explained.[25,28] Given that this survey identified low engagement with exercise recommendations, educational modules could provide concrete examples of appropriate low-stress physical activities during periods of symptom fluctuation, such as walking, stretching, or non-competitive recreational exercise, together with explanations of why excessive physical stress or highly competitive activities may aggravate tic symptoms in some children. Studies of pediatric massage and combined TCM regimens for tic disorders indicate that caregivers are more likely to adhere to complex treatment packages when they receive clear written schedules and are involved in monitoring symptom change over time.[26,27]

Attitude-focused strategies warrant equal attention. Given the ambivalence about safety and speed of TCM treatments, clinicians could present balanced summaries of current RCTs and observational studies of commonly used formulas and procedures, using language that highlights both benefits and documented risks without overstating either side. Related research suggests that parents are receptive to integrative care when they perceive that recommendations are grounded in formal evidence rather than tradition alone, and when they understand how TCM is positioned relative to Western pharmacotherapy and behavioral treatment.[24,30] Discussion of trial findings on preparations framed in terms of symptom reduction and adverse reaction profiles, may help families calibrate expectations and avoid both overenthusiasm and unwarranted skepticism.[29,33] Such conversations can also serve to align family goals with realistic treatment trajectories, which may, in turn, strengthen the link between attitudes and sustained practice observed in the structural model.

The roles of different stakeholders are clear from these data. Clinicians in neurology and psychiatry shape initial diagnoses and treatment plans, while TCM practitioners, nurses, and health educators are responsible for day-to-day guidance, especially regarding TCM modalities and home-based practices. Research suggests that interdisciplinary teams, including both Western-trained and TCM professionals, are better equipped to address caregiver questions, provide consistent health information, and reduce contradictory recommendations that may undermine caregiver trust.[24,25] At the same time, broader system-level initiatives, such as training programs that enhance clinicians' knowledge and confidence in managing tic disorders, may indirectly influence caregiver KAP by improving the quality and consistency of information offered during consultations.[22,23] Community-level activities, including parent groups and digital platforms moderated by professionals, may also help convert individual knowledge gains into social support networks where caregivers feel more comfortable sharing experiences and endorsing evidence-based TCM options.[19–21]

This study has several limitations that should be considered when interpreting the findings. First, the study was conducted at a single center using a convenience-sampling strategy, which may limit the representativeness and generalizability of the findings to caregivers from other regions, healthcare systems, or cultural backgrounds. In addition, baseline familiarity with and acceptance of Traditional Chinese Medicine may vary substantially across regions and populations in China, which could have influenced caregivers' reported knowledge, attitudes, and practices related to TCM-based management of tic disorders. Second, the cross-sectional design precludes causal inference. Although multivariate regression and path analysis were used to explore potential associations among knowledge, attitudes, and practices, unmeasured confounding factors may still have influenced the observed relationships. In addition, the present study did not include detailed clinical indicators such as tic severity, daily tic frequency, comorbid neuropsychiatric conditions, or standardized assessment tools including the Yale Global Tic Severity Scale (YGTSS). These disease-related characteristics may substantially influence caregiver experiences, treatment decisions, and TCM-related management behaviors. Third, all data were self-reported, which may introduce recall bias and social desirability bias despite the use of a standardized and pilot-tested questionnaire. In addition, some practice-frequency response options, such as "always" or "often," may have been interpreted differently by participants because these terms did not correspond to

strictly standardized behavioral frequencies. This variability in interpretation may have affected response consistency across individuals. Furthermore, some knowledge items contained relatively specialized TCM terminology because the questionnaire was developed based on expert consensus regarding TCM diagnosis and treatment of pediatric tic disorders. Although most participants in the pilot survey considered the questionnaire understandable and acceptable, the use of professional terminology may still have reduced comprehension among some non-medical caregivers. Future research should adopt multicenter and longitudinal designs, include geographically and culturally diverse populations, incorporate detailed clinical assessments, compare caregivers' perceptions of TCM and Western medicine, and develop more simplified, family-friendly questionnaire tools while maintaining sufficient clinical relevance.

Conclusion

In conclusion, caregivers of children with tic disorders demonstrated insufficient knowledge and suboptimal TCM-related practices despite generally positive attitudes, and higher knowledge and more favorable attitudes were strongly associated with more active engagement in TCM-based management. To enhance clinical outcomes, structured, evidence-based caregiver education and counseling on TCM diagnosis and treatment should be systematically implemented to correct misconceptions, strengthen practical skills, and support sustained participation in integrative care.

Data Sharing Statement

All data generated or analysed during this study are included in this published article.

Ethics Approval and Consent to Participate

This study was approved by the Wuhan Children's Hospital Ethics Committee (Approval No. 2024R110-E01), and informed consent was obtained from all participants. All procedures were conducted in accordance with the Declaration of Helsinki.

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

All authors declare that they have no conflicts of interest in this work.

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