

## Influencing Factors on Awareness and Utilization of Traditional Chinese Medicine Guidelines for Diabetes Mellitus among Primary Care Physicians (Post-Print)

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### Abstract

**Background** Primary care physicians play a crucial role in primary healthcare services, and clinical practice guidelines are essential tools for guiding clinical practice. Understanding primary care physicians' awareness level and current usage status of guidelines can provide new perspectives for guideline promotion and training, and for improving the quality of primary care.

**Objective** To investigate primary care physicians' awareness level and current reference and usage status of Traditional Chinese Medicine (TCM) guidelines for diabetes, and to explore the influencing factors.

**Methods** From September 22, 2021, to October 29, 2021, an online survey was conducted by distributing electronic questionnaires through the Diabetes Primary Prevention and Treatment Expert Guidance Committee of China Association of Chinese Medicine, with snowball sampling employed to reach additional physicians. The questionnaire comprised three sections: basic information, current status and needs of physicians using TCM for diabetes prevention and treatment, and survey on current status and needs of physicians' awareness of diabetes guidelines. Ordinal multiclass Logistic regression analysis was used to analyze the influencing factors of primary care physicians' awareness level and usage status of TCM guidelines for diabetes.

**Results** A total of 382 valid questionnaires were collected from primary care physicians. 35.34% (135/382) of physicians were very or relatively familiar with TCM guidelines for diabetes, and 28.80% (110/382) frequently referenced these guidelines. Univariate analysis revealed statistically significant differences in the reference status of diabetes TCM guidelines among primary care physicians of different genders, specialties, departments, number of diabetic patients

treated per week, evaluation of TCM efficacy, whether their institution could purchase Chinese herbal decoctions or patent medicines recommended by guidelines, and guideline awareness level ( $P < 0.05$ ). Ordinal multiclass Logistic regression analysis showed that influencing factors for primary care physicians' awareness level of TCM guidelines for diabetes were: perceiving TCM efficacy as highly effective (OR=5.783, 95% CI=1.283–26.102), availability of guideline-recommended Chinese herbal decoctions or patent medicines at the physician's institution (OR=2.399, 95% CI=1.548–3.717), and prior participation in specialized training on diabetes prevention and treatment guidelines (OR=1.751, 95% CI=1.149–2.667). Influencing factors for primary care physicians' reference status of TCM guidelines for diabetes were: physicians' awareness level of guidelines [very or relatively familiar (OR=15.721, 95% CI=7.584–32.557), generally familiar (OR=5.392, 95% CI=2.841–10.237)], practice duration of  $\geq 5$  years (OR=14.083, 95% CI=1.390–142.594), different specialties [TCM specialty (OR=6.869, 95% CI=1.483–31.849), integrative Chinese and Western medicine specialty (OR=6.613, 95% CI=1.551–28.219)], and different geographical regions [northeastern region (OR=2.962, 95% CI=1.064–8.240), southeastern region (OR=2.686, 95% CI=1.004–7.178)].

**Conclusion** Primary care physicians' awareness level and reference usage of TCM guidelines for diabetes require improvement. Awareness level of guidelines, years of practice, specialty, and geographical region are important factors influencing physicians' guideline usage. Future initiatives should enhance training efforts for primary care physicians, particularly strengthening training on TCM guidelines for diabetes prevention and treatment for physicians in northwestern and southwestern regions and those with a TCM specialty background.

## Full Text

### Abstract

**Background:** Primary care physicians (PCPs) play a crucial role in providing primary healthcare services and utilize clinical practice guidelines as valuable tools for guiding their practice. By investigating these physicians' awareness and usage of guidelines, we can offer innovative strategies for promoting guideline adherence and enhancing physician training, ultimately improving the quality of primary healthcare.

**Objective:** To explore the level of awareness and current status of reference use of traditional Chinese medicine (TCM) guidelines for diabetes among PCPs, and to identify the influencing factors.

**Methods:** From September 22, 2021, to October 29, 2021, an online questionnaire survey was conducted among physicians affiliated with the Specialist Committee for Primary Diabetes Care of the China Association of Chinese Medicine, using the snowball sampling method to ensure broader representation. The questionnaire consisted of three parts: basic information, current status and needs

of physicians in using TCM for diabetes prevention and treatment, and a survey on physicians' current awareness and needs regarding diabetes guidelines. Ordered multinomial logistic regression analysis was used to identify the influencing factors of PCPs' awareness and usage of TCM guidelines for diabetes.

**Results:** A total of 382 valid questionnaires were collected from PCPs. 35.34% (135/382) of the physicians were very familiar or fairly familiar with TCM guidelines for diabetes, while 28.80% (110/382) regularly referred to these guidelines for diabetes management. Univariate analysis showed statistically significant differences ( $P < 0.05$ ) in guideline reference status among PCPs with different gender, specialty, department, number of diabetic patients treated per week, evaluation of TCM treatment efficacy, availability of TCM herbs and Chinese patent drugs in their institutions, and awareness of guidelines. Ordered multinomial logistic regression analysis revealed that factors influencing PCPs' awareness of TCM guidelines for diabetes included: evaluation of TCM treatment efficacy as very effective (OR=5.783, 95%CI=1.283-26.102), availability of TCM herbs and Chinese patent drugs in physicians' institutions (OR=2.399, 95%CI=1.548-3.717), and previous participation in specialized training on diabetes prevention and control guidelines (OR=1.751, 95%CI=1.149-2.667). Factors influencing PCPs' reference to TCM guidelines for diabetes included: level of familiarity with guidelines [very or fairly familiar (OR=15.721, 95%CI=7.584-32.557), somewhat familiar (OR=5.392, 95%CI=2.841-10.237)], work experience  $\geq 5$  years (OR=14.083, 95%CI=1.390-142.594), different specialties [TCM (OR=6.869, 95%CI=1.483-31.849), Integrated Chinese and Western Medicine (OR=6.613, 95%CI=1.551-28.219)], and geographical regions [Northeast (OR=2.962, 95%CI=1.064-8.240), Southeast (OR=2.686, 95%CI=1.004-7.178)].

**Conclusion:** The awareness and reference usage of TCM guidelines for diabetes among PCPs need improvement. Guideline awareness, work experience, professional orientation, and geographical region significantly influence physicians' utilization of guidelines. Future training for PCPs should be strengthened, particularly in northwest and southwest regions, and PCPs with TCM backgrounds should receive more training on TCM-related guidelines for diabetes prevention and treatment.

**Keywords:** Diabetes mellitus; Traditional Chinese medicine therapy; Guideline; Primary healthcare; Community health services; Root cause analysis

## Background

China faces a significant diabetes burden, with the prevalence of diabetes among adults continuing to rise, reaching 11.9% in recent years. However, the awareness, treatment, and control rates of diabetes are only 38.0%, 34.1%, and 33.1%, respectively [1], making diabetes prevention and treatment in primary care settings a formidable task. Traditional Chinese medicine represents an important approach to diabetes management, and clinical guidelines serve as essential

guiding documents for clinical practice. Under the national policy of “giving equal emphasis to Chinese and Western medicine,” relevant academic societies in China have successively published multiple diabetes-related TCM guidelines [2-4]. Previous studies have investigated PCPs’ mastery of diabetes prevention and treatment guidelines. For example, a survey of 84 general practitioners in Pudong New Area, Shanghai, by Huang et al. [5] found that 26.2% were very familiar with the “China Type 2 Diabetes Prevention and Treatment Guidelines (2013 Primary Care Version)” and 58.3% were fairly familiar, suggesting that community diabetes prevention efforts should target weak links for professional training. Zhou et al. [6] surveyed 304 primary care health workers in Beijing and found low awareness and learning rates of the “Clinical Evidence-Based Practice Guidelines for Diabetes with Traditional Chinese Medicine” among primary care general practitioners, recommending strengthened guideline promotion in communities. However, previous studies generally analyzed the cognitive status of PCPs regarding diabetes TCM guidelines, with fewer investigations into related influencing factors. Therefore, this study aimed to investigate and understand the level of awareness and current usage of diabetes TCM guidelines among PCPs, and to explore their influencing factors using ordered multinomial logistic regression analysis based on univariate analysis. This research seeks to identify the main factors affecting PCPs’ reference to diabetes TCM guidelines and propose new ideas and improvement strategies for targeted guideline promotion and training for primary care physicians.

## Methods

### Study Population

From September 22, 2021, to October 29, 2021, we conducted an online survey by sending electronic questionnaires to members or applicants of the Specialist Committee for Primary Diabetes Care of the China Association of Chinese Medicine, using the snowball sampling method to reach a broader physician population. Inclusion criteria were: (1) physicians working in primary healthcare institutions, including community health service centers (stations), township health centers, and village clinics; (2) voluntary participation after reading the informed consent form; and (3) complete questionnaire data without logical errors. This study used ordered multinomial logistic regression analysis to explore influencing factors of PCPs’ reference to diabetes TCM guidelines, with 14 independent variables. Considering that sample size  $n$  should be at least 10-15 times the number of independent variables [7] and accounting for a potential 20% disqualification rate, the minimum required sample size was determined to be 168-252. This study was approved by the Medical Ethics Committee of the First Affiliated Hospital of Xiamen University (Approval No.: XMY-2021KY027-02).

## Survey Questionnaire and Methods

The research team developed the “Physicians’ Knowledge, Attitudes, Practices, and Needs Regarding Diabetes TCM Prevention and Treatment Guidelines” questionnaire. After pilot testing and expert consultation, the questionnaire was refined. It consisted of three main parts: basic information, current status and needs of physicians in using TCM for diabetes prevention and treatment, and a survey on physicians’ current awareness and needs regarding diabetes guidelines. Specific items included age, gender, education level, professional specialty, work experience, professional title, department, number of diabetic patients treated per week, evaluation of TCM efficacy for diabetes treatment, availability of guideline-recommended TCM herbs and Chinese patent drugs in physicians’ institutions, presence of diabetes comprehensive health management teams in physicians’ institutions, previous participation in specialized training on diabetes prevention and treatment guidelines, familiarity with guidelines, and guideline reference status. Physicians’ familiarity with and reference to guidelines were assessed using a 5-point Likert scale: “regularly reference,” “sometimes reference,” “occasionally reference,” “rarely reference,” and “never reference” for reference status; and “very familiar,” “fairly familiar,” “somewhat familiar,” “not very familiar,” and “not familiar at all” for familiarity.

The survey was assisted by professionally trained investigators who distributed online links via the WeChat platform. After physicians completed the questionnaires, investigators carefully cross-checked the data. Questionnaires with obvious missing items or logical errors were verified by telephone or excluded to ensure quality. To obtain scientifically valid data, informed consent forms, questionnaire instructions, and detailed guidelines were sent to the WeChat groups before the survey, and completion was encouraged within a unified time frame whenever possible. A total of 382 valid questionnaires from PCPs were collected.

## Statistical Methods

Statistical analysis was performed using SAS 9.4 software. Normally distributed continuous data were expressed as ( $\bar{x}\pm s$ ), while categorical data were expressed as frequencies and percentages, with comparisons made using Cochran-Mantel-Haenszel (CMH) tests. Ordered multinomial logistic regression analysis was used to examine factors influencing PCPs’ reference to diabetes TCM guidelines. A two-sided  $P<0.05$  was considered statistically significant.

## Results

### Basic Information of Study Participants

Among the 382 PCPs, 209 (54.71%) were male and 173 (45.29%) were female. Ages ranged from 22 to 65 years, with a mean age of ( $41.3\pm 8.1$ ) years. Education levels: 213 (55.76%) had bachelor’s degrees. Professional specialties:

200 (52.36%) were in clinical medicine. Work experience: 147 (38.48%) had 6-15 years of practice. Professional titles: 170 (44.50%) were junior physicians. Geographic distribution: 199 (52.09%) were from southeast regions. Number of diabetic patients treated per week: 117 (30.63%) treated  $\leq 5$  patients. Evaluation of TCM efficacy: 221 (57.85%) rated it as “fairly effective.” Availability of guideline-recommended TCM herbs and Chinese patent drugs: 237 (62.04%) reported their institutions could purchase them. Presence of diabetes comprehensive health management teams: 105 (27.49%) reported having such teams in their institutions. Previous training: 216 (56.54%) had received specialized training on diabetes prevention and treatment guidelines.

### **Comparison of TCM Guideline Reference Among PCPs with Different Characteristics**

PCPs’ reference to diabetes TCM guidelines was categorized as: regularly reference (110, 28.80%), sometimes or occasionally reference (229, 59.95%), and rarely or never reference (43, 11.26%). Univariate analysis revealed statistically significant differences ( $P < 0.05$ ) in guideline reference status among PCPs with different gender, specialty, department, number of diabetic patients treated per week, evaluation of TCM treatment efficacy, availability of guideline-recommended TCM herbs and Chinese patent drugs in their institutions, and familiarity with guidelines .

### **Ordered Multinomial Logistic Regression Analysis of Factors Influencing Awareness**

Using PCPs’ awareness of diabetes TCM guidelines as the dependent variable (assignment: very or fairly familiar=1, somewhat familiar=2, not very familiar or unfamiliar=3) and variables X1-X13 from as independent variables, ordered multinomial logistic regression analysis was performed. Likelihood ratio test results showed  $\chi^2=115.161$ ,  $P < 0.001$ ; goodness-of-fit test showed  $\chi^2=713.031$ ,  $P=0.556$ , indicating good model fit; parallel lines test showed  $\chi^2=15.439$ ,  $P=0.996$ , confirming the proportional odds assumption. Therefore, the ordered multinomial logistic regression analysis was feasible and meaningful.

Results showed that factors influencing PCPs’ awareness of diabetes TCM guidelines included: evaluation of TCM efficacy as very effective (OR=5.783, 95%CI=1.283-26.102), availability of guideline-recommended TCM herbs and Chinese patent drugs in physicians’ institutions (OR=2.399, 95%CI=1.548-3.717), and previous participation in specialized training on diabetes prevention and treatment guidelines (OR=1.751, 95%CI=1.149-2.667) .

### **Ordered Multinomial Logistic Regression Analysis of Factors Influencing Reference Usage**

Using PCPs’ reference to diabetes TCM guidelines as the dependent variable (assignment: regularly reference=1, sometimes or occasionally reference=2,

rarely or never reference=3) and all X variables from as independent variables, ordered multinomial logistic regression analysis was performed. Likelihood ratio test results showed  $\chi^2=158.751$ ,  $P<0.001$ ; goodness-of-fit test showed  $\chi^2=777.311$ ,  $P=0.079$ , indicating good model fit; parallel lines test showed  $\chi^2=31.997$ ,  $P=0.614$ , confirming the proportional odds assumption. Therefore, the ordered multinomial logistic regression analysis was feasible and meaningful.

Results showed that factors influencing PCPs' reference to diabetes TCM guidelines included: level of familiarity with guidelines [very or fairly familiar (OR=15.721, 95%CI=7.584-32.557), somewhat familiar (OR=5.392, 95%CI=2.841-10.237)], work experience  $\geq 5$  years (OR=14.083, 95%CI=1.390-142.594), different specialties [TCM (OR=6.869, 95%CI=1.483-31.849), Integrated Chinese and Western Medicine (OR=6.613, 95%CI=1.551-28.219)], and different geographical regions [Northeast (OR=2.962, 95%CI=1.064-8.240), Southeast (OR=2.686, 95%CI=1.004-7.178)] .

## Discussion

### Differences in Reference Usage Among PCPs with Different Characteristics

Univariate analysis revealed that male physicians, those specializing in TCM-related fields, working in TCM departments, treating  $\geq 15$  diabetic patients per week, evaluating TCM efficacy as very effective, working in institutions that could purchase guideline-recommended TCM herbs and Chinese patent drugs, and those very familiar with guidelines demonstrated better reference status for diabetes TCM guidelines. These findings share similarities and differences with previous research. Zhou et al. [6] found that male TCM general practitioners had higher guideline learning rates than females, consistent with our results. Ren et al. [9] found that lower education levels, lower hospital grades, lower professional titles, and less work experience were main factors affecting hypertension knowledge among primary care physicians in Shanxi. In our study, no statistically significant differences were found in guideline reference status among PCPs with different education levels, professional titles, or work experience. However, gender, specialty, department, number of diabetic patients treated per week, evaluation of TCM efficacy, availability of TCM drugs in institutions, and guideline familiarity significantly influenced reference status.

PCPs' familiarity with guidelines was the primary influencing factor for their reference to diabetes TCM guidelines ( $P<0.05$ ), indicating that in clinical practice, physicians with TCM backgrounds pay more attention to diabetes TCM guidelines, aligning with basic expectations. In our study, PCPs treating  $>15$  diabetic patients per week referenced diabetes TCM guidelines less frequently than those treating  $\geq 15$  patients, possibly due to heavier workloads and greater time pressure, which also reflects the importance of improving the quality and clinical relevance of diabetes TCM guidelines [10]. Additionally, evaluation of TCM efficacy, availability of TCM drugs in institutions, and guideline fa-

miliarity were important factors influencing PCPs' reference to diabetes TCM guidelines, highlighting the importance of strengthening TCM knowledge training, guideline promotion, and basic TCM drug configuration in primary care institutions [11].

### **Influencing Factors of Awareness and Reference Usage**

Our results showed that PCPs' familiarity with guidelines was the most important factor influencing their reference to diabetes TCM guidelines. As many previous studies have indicated, successful implementation of clinical practice guidelines is closely related to physicians' awareness and attitudes [12-15]. A systematic review published in JAMA [14] showed that lack of guideline awareness and unfamiliarity with guidelines were important reasons for clinical practice deviating from guideline recommendations. WIDYAHENING et al. [15] found in a cross-sectional survey of PCPs that lack of awareness of type 2 diabetes guidelines among physicians and patients could lead to approximately 70% non-adherence. Therefore, strengthening guideline promotion, dissemination, and training to improve PCPs' awareness is crucial for enhancing guideline reference and implementation rates.

Work experience  $\geq 5$  years was the second most important factor influencing PCPs' reference to diabetes TCM guidelines, which differs from some domestic studies. For example, Liu et al. [16] found that longer work experience was associated with better understanding and usage of guidelines and consensus among cardiologists. This difference may be related to the relatively late development of diabetes TCM guidelines compared to Western medicine guidelines, which have more high-quality evidence and stronger clinical practicality. Future efforts should focus on strengthening the development of TCM guidelines. Specialty was the third important factor, with TCM physicians referencing diabetes TCM guidelines more frequently, which aligns with clinical reality and suggests that under the national strategy of "giving equal emphasis to Chinese and Western medicine," we should strengthen TCM diagnosis and treatment knowledge promotion and training for Western physicians interested in TCM [17]. Geographical region also influenced guideline reference, with PCPs in northeast and southeast regions showing better reference status, possibly related to regional development levels. Additionally, existing diabetes TCM guidelines, such as the 2011 "TCM Prevention and Treatment Guidelines for Diabetes," the 2016 "Clinical Evidence-Based Practice Guidelines for Diabetes with Traditional Chinese Medicine," and the 2019 "Clinical Diagnosis and Treatment Guidelines for Diabetes in Traditional Chinese Medicine," were led by experts and institutions in north and east China, which may contribute to regional differences in guideline reference. This suggests we should strengthen guideline promotion and training nationwide, especially in southwest and northwest regions.

Since PCPs' familiarity with guidelines was the primary factor influencing their reference status, we further analyzed factors affecting awareness. Results showed that evaluation of TCM efficacy was the most important factor influencing

awareness of diabetes TCM guidelines. Increasing research evidence confirms that some classical TCM formulas have outstanding efficacy, with some having been developed into modern pharmaceutical preparations for diabetes treatment with good results [18]. Additionally, acupuncture, massage, auricular therapy, and external treatments such as herbal fumigation and acupoint application have important value in diabetes prevention and management, warranting strengthened TCM education and training.

Availability of TCM drugs in institutions was the second most important factor influencing awareness. Zhang et al. [19] found in a survey of 2,443 primary care institutions nationwide that the availability rates of basic hypoglycemic drugs were only 33.00% in township health centers and 47.21% in community health service centers, with insufficient availability and urban-rural disparities. The newly released “National Guidelines for Primary Care TCM Prevention and Management of Diabetes (2022)” emphasizes strengthening TCM drug configuration, including commonly used Chinese patent medicines and herbal decoctions in primary care settings [20]. Previous participation in guideline training was the third influencing factor, consistent with multiple domestic studies [21-22] showing that trained medical personnel had better mastery of health knowledge and clinical guidelines. Therefore, strengthening primary infrastructure, basic TCM drug configuration, and actively organizing PCP training are important for improving primary healthcare quality.

### **Recommendations for Promoting TCM Guidelines in Primary Care**

Based on analysis of 382 PCPs, we propose the following recommendations for promoting diabetes TCM guidelines in primary care institutions: (1) Deeply understand primary care needs, develop practical diabetes TCM guidelines for primary care settings, and strengthen specialized training for PCPs on TCM diabetes prevention and treatment, especially for those with TCM backgrounds and less work experience; (2) Further strengthen primary healthcare infrastructure in China to ensure availability of commonly used TCM herbs and Chinese patent medicines in primary care institutions; (3) Deepen team-based management model construction, encourage multidisciplinary collaboration with TCM participation, and enhance physicians’ familiarity with TCM diabetes prevention and guidelines through training and interaction to increase reference rates.

### **Limitations**

This nationwide survey of physicians has certain representativeness, but limitations exist. First, data on PCPs’ awareness and reference usage of diabetes TCM guidelines were self-reported, potentially causing reporting bias. Second, although we attempted to include comprehensive variables for influencing factor analysis, investigation of primary infrastructure and real-world conditions of primary care institutions was relatively limited, which requires more in-depth field research or combined quantitative and qualitative approaches for validation in future studies.

## Conclusion

In summary, this survey of 382 PCPs found that awareness and reference usage of diabetes TCM guidelines were relatively low. Guideline familiarity, work experience, professional orientation, and geographical region significantly influenced guideline usage, while evaluation of TCM efficacy, availability of TCM drugs in institutions, and previous guideline training influenced guideline awareness. Relevant national departments and guideline promoters should focus on these factors and implement effective measures to improve diagnosis and treatment quality in primary healthcare institutions.

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