Post-print: Expert Questionnaire Survey and Results Analysis on TCM Symptom Assessment for High-Risk Osteoporosis Populations in the Lingnan Region

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Abstract

Background The development of osteoporosis is a prolonged process; therefore, skeletal health should be a lifelong concern, and early prevention and treatment hold significant positive value.

Objective To conduct an expert questionnaire survey and analysis on Traditional Chinese Medicine (TCM) symptom assessment for high-risk populations of osteoporosis in the Lingnan region, thereby forming expert consensus opinions.

Methods The Delphi method was employed. Based on a review of existing literature and the first-round "Questionnaire Survey on TCM Symptom Assessment for High-risk Populations of Osteoporosis in the Lingnan Region," and incorporating suggestions from experts at the First Lingnan Bone and Joint Diseases Academic Conference (December 2021) and the Expert Group of the Bone and Joint Degeneration and Injury Committee of Guangdong Provincial Association of Chinese Medicine, the second-round expert questionnaire was compiled and optimized. Opinions were solicited from orthopedics specialists in the Lingnan region, and the survey data were analyzed and statistically processed.

Results (1) The surveyed experts demonstrated high enthusiasm and professional competence, with broad regional distribution, indicating good representativeness. (2) The experts' opinions showed high concentration and coordination. The prioritized TCM symptom items for high-risk osteoporosis populations in the Lingnan region were, in sequence: "deformity and kyphosis"; "general bone pain"; "fracture occurrence within the past 5 years"; "low back pain";

"height loss"; "joint heaviness"; "body heaviness and fatigue"; "lassitude"; "loose teeth and hair loss," among others.

Conclusion The integration of evidence-based medicine with the Delphi method can effectively summarize expert recommendations in this field regarding TCM symptom assessment for high-risk osteoporosis populations in the Lingnan region, providing a rational basis for subsequent early disease diagnosis and assessment scale development.

Full Text

Preamble

Expert Questionnaire Survey and Result Analysis of TCM Symptom Assessment in High-Risk Population of Osteoporosis in Lingnan Region

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Abstract

Background: The occurrence and development of osteoporosis is a prolonged process, necessitating attention to bone health throughout the entire life cycle. Early prevention and treatment hold significant positive implications.

Objective: To conduct expert questionnaire analysis on Traditional Chinese Medicine (TCM) symptom assessment for high-risk osteoporosis populations in the Lingnan region and formulate expert consensus opinions.

Methods: Using the Delphi method, we optimized the second-round expert questionnaire based on previous literature review and the first-round "Questionnaire Survey on TCM Symptom Assessment for High-Risk Osteoporosis Populations in Lingnan Region," incorporating expert recommendations from the First Lingnan Bone and Joint Disease Academic Conference (December

2021) and the Expert Panel of the Bone and Joint Degeneration and Injury Committee of Guangdong Provincial Association of Chinese Medicine. We solicited opinions from orthopedics experts in the Lingnan region and performed statistical analysis of the survey results.

Results: (1) The surveyed experts demonstrated high enthusiasm and professional competence, with broad regional distribution representing good overall representation. (2) Experts showed high levels of opinion concentration and coordination. The prioritized TCM symptom items for high-risk osteoporosis populations in Lingnan region were: "Humpback deformity"; "General bone pain"; "Fracture occurrence within recent 5 years"; "Lumbar and back pain"; "Reduced height"; "Heavy joint sensation"; "Body heaviness and fatigue"; "Lassitude"; and "Tooth loosening and hair loss."

Conclusion: The combination of evidence-based medicine and Delphi method effectively summarizes expert recommendations on TCM symptom assessment for high-risk osteoporosis populations in Lingnan region, providing a reasonable basis for subsequent early diagnosis and assessment scale development.

Keywords: High-risk population of osteoporosis; Lingnan region; Expert questionnaire survey; TCM symptom assessment

Osteoporosis is a systemic metabolic skeletal disease characterized by reduced bone mass, destroyed bone microstructure, increased bone fragility, and susceptibility to fractures. It has gradually become one of the most common and prevalent chronic diseases among middle-aged and elderly populations in China [1-4]. With social development and aging trends, osteoporosis incidence continues to rise, while early diagnosis and integrated Chinese-Western medicine treatment demonstrate favorable outcomes. Consequently, risk identification and process management for high-risk populations have emerged as critical areas for expanded research [5-6].

The Delphi method is a structured decision-making support technique designed to obtain relatively objective opinions through multiple rounds of independent expert judgment and feedback during information collection [7-8]. Our research group employed the Delphi method to optimize the second-round expert questionnaire based on previous literature review and the first-round "Questionnaire Survey on TCM Symptom Assessment for High-Risk Osteoporosis Populations in Lingnan Region," incorporating expert recommendations from the First Lingnan Bone and Joint Disease Academic Conference (December 2021) and the Expert Panel of the Bone and Joint Degeneration and Injury Committee of Guangdong Provincial Association of Chinese Medicine. We solicited opinions from orthopedics experts in the Lingnan region to explore TCM symptom assessment issues for high-risk osteoporosis populations, providing a reasonable foundation for subsequent early diagnosis and assessment scale development.

1.1 Expert Selection

Based on Delphi method recommendations regarding the number of experts and considering factors of authority, representativeness, and breadth, combined with professional technical fields and regional distribution, we initially selected 192 frontline clinical experts from Lingnan region specializing in TCM orthopedics or integrated Chinese-Western medicine orthopedics with intermediate-level or higher professional titles. Surveyed experts were recruited from various tertiary hospitals, TCM universities, and affiliated hospitals across Lingnan region, possessing substantial clinical experience and professional influence in osteoporosis diagnosis and prevention, demonstrating strong interest in the project and willingness to cooperate with questionnaire research.

1.2.1 Expert Survey Form

Our research group designed the first-round Delphi expert survey form encompassing two aspects: (1) Definition and TCM symptom composition for high-risk osteoporosis populations in Lingnan region, and (2) Weight judgment methods for questionnaire items. The second-round Delphi survey form was primarily based on first-round results, which were fed back to experts for potential modification suggestions. Both rounds included supplementary text fields for experts to provide additional recommendations.

1.2.2 Scoring System

Each questionnaire item was scored on a 100-point scale based on symptom importance for assessing high-risk osteoporosis populations in Lingnan region. Higher scores indicated greater importance. For example, the most important symptom for assessment would receive 100 points, while a symptom with no assessment value would receive 0 points. The scale comprised five levels: "Very important (100 points)," "Relatively important (75 points)," "Moderately important (50 points)," "Less important (25 points)," and "Not important (0 points)."

1.3 Statistical Analysis

Survey data were analyzed using SPSS software (Version 21.0; SPSS Inc., Chicago, IL, USA) and Excel 2003, focusing on evaluation indicators including expert response rate, authority coefficient, opinion concentration, and coordination level.

1.3.1 Expert Response Rate The expert response rate reflects questionnaire return status and item completion, indicating experts' understanding of and attention to the research.

1.3.2 Expert Authority Coefficient The expert authority coefficient reflects expert authority level, typically assessed through two factors: (1) Basis

for expert judgment on specific issues, and (2) Expert familiarity with corresponding indicators. Calculation formula: Authority coefficient = (Familiarity + Judgment basis) / 2. Judgment basis includes: A) Reference to domestic and international literature; B) Theoretical analysis; C) Practical experience; and D) Intuition and grasp of latest research advances, with values assigned according to large, medium, and small influence degrees. Familiarity is categorized into six levels: "Very familiar," "Familiar," "Relatively familiar," "Generally familiar," "Relatively unfamiliar," and "Very unfamiliar," scored as 1.0, 0.8, 0.6, 0.4, 0.2, and 0 points respectively [9].

1.3.3 Expert Opinion Concentration Opinion concentration measures the degree of consensus on item importance, typically analyzed using sample mean and full-score ratio. Sample mean represents the average score assigned to an item, while full-score ratio indicates the percentage of experts who assigned full marks to that item [10]. Higher means and full-score ratios suggest greater item importance.

1.3.4 Expert Opinion Coordination Opinion coordination assesses potential disagreement among experts regarding item scoring, typically analyzed using coefficient of variation (CV), which is the ratio of standard deviation to sample mean. Lower CV values indicate higher coordination and smaller disagreement among experts [9-10].

2.1 Expert Demographics

Our research group selected 192 experts with solid TCM/integrated Chinese-Western medicine theoretical knowledge and clinical skills from Lingnan region, covering various provinces and cities. Expert research directions included TCM orthopedics, integrated Chinese-Western medicine orthopedics, and clinical rehabilitation, spanning TCM clinical practice, integrated clinical practice, and scientific research. The cohort comprised 115 male and 77 female experts, including 31 chief physicians, 76 deputy chief physicians, and 85 attending physicians, all with $ $6 years of professional experience.

2.2 Expert Response Rate

Both rounds of questionnaires were fully returned with all items completed according to specifications, achieving a 100% response rate and 100% expert enthusiasm coefficient, indicating excellent expert engagement and feedback quality.

2.3 Expert Authority Coefficient

Expert authority coefficient was assessed through self-evaluation, based on judgment basis and item familiarity. An authority coefficient $ $0.70 is considered acceptable [9–10]. The average authority coefficient for all 192 experts was $0.81 \pm$ $0.04, indicating high credibility of our results.

2.4.1 Definition Analysis of High-Risk Osteoporosis Populations in Lingnan Region

Based on the first-round questionnaire, we supplemented Western medical diagnoses including low bone mass from ICD-11. The definition integrates TCM "preventive treatment" theory, modern health concepts, and chronic disease management requirements, targeting patients aged $ $40 years in Lingnan region with normal or reduced bone mass who are prone to developing osteoporosis, particularly focusing on low bone mass patients aged 40-75 years. Western diagnoses from ICD-11 include: Osteopenia (FB83), Reduced bone mass (FB83.0), Postmenopausal osteopenia (FB83.01), and Senile osteopenia (FB83.02).

Two rounds of expert surveys on this definition showed supportive attitudes from 169 experts (88.02%) in the first round and 178 experts (92.70%) in the second round. Opposing opinions were expressed by 15 experts (7.81%) in the first round and 0 experts (0%) in the second round. Neutral attitudes accounted for 8 experts (4.17%) and 9 experts (4.69%) respectively (see Table 1).

2.4.1 TCM Symptom Composition and Weight Estimation

Based on preliminary literature review and case retrospective studies, our research group initially formulated various TCM symptom items for high-risk osteoporosis populations in Lingnan region. Sample mean, full-score ratio, standard deviation, and coefficient of variation were used to comprehensively evaluate expert opinion concentration and coordination across both survey rounds (see Table 2).

In both rounds, symptom items were ranked by mean value from strongest to weakest representativeness: "Humpback deformity" ("General bone pain"), "General bone pain" ("Humpback deformity"), "Fracture occurrence within recent 5 years," "Lumbar and back pain," "Reduced height," "Heavy joint sensation," "Body heaviness and fatigue" ("Lassitude"), "Lassitude" ("Body heaviness and fatigue"), and "Tooth loosening and hair loss." Items in parentheses indicate symptoms with changed ranking in the second round compared to the first round; other items maintained consistent ranking.

The symptom with the lowest coefficient of variation was "Humpback deformity" (15.61% and 15.14%), followed by "General bone pain" (17.09% and 16.28%). Additionally, experts supplemented items including "Obesity," "Persistent mild fever," "Head heaviness as if wrapped," and "Sticky mouth sensation" as potential symptoms.

2.5 Expert Meeting Validation

The conference expert panel conducted comprehensive and systematic discussions on TCM symptom assessment for high-risk osteoporosis populations in Lingnan region, further summarizing and analyzing data from both Delphi survey rounds to reach relatively consistent conclusions. Most experts agreed that

researching this topic holds substantial clinical demand and practical guidance value. The prioritized TCM symptom items were: "Humpback deformity," "General bone pain," "Fracture occurrence within recent 5 years," "Lumbar and back pain," "Reduced height," "Heavy joint sensation," "Body heaviness and fatigue," "Lassitude," and "Tooth loosening and hair loss."

3.1 Analysis and Evaluation of Results

The Delphi method was first reported in the 1940s by scholars O. Helmer and N. Dalkey, later expanded by T.J. Gordon and the RAND Corporation. As an optimized development of expert meeting prediction methods, Delphi primarily solicits expert opinions anonymously through several rounds of correspondence, gradually converging expert group opinions to achieve predictive objectives [11-12]. Due to its unique characteristics (feedback, convergence, statistical analysis, and anonymity), Delphi has been widely applied in TCM syndrome and core element research, clinical efficacy evaluation, and other areas, achieving favorable results [13-15]. As this approach integrates qualitative and quantitative methods, Delphi demonstrates reasonable feasibility and scientific validity in practical application, reflecting relative objectivity in the evaluation process.

Our research group summarized relevant characteristic items of TCM symptoms for high-risk osteoporosis populations in Lingnan region based on literature review, first-round questionnaire results, and expert recommendations from the December 2021 conference. Considering expert geographic distribution, work experience, professional titles, and institutions, we selected 192 orthopedics experts from Lingnan region. Analysis yielded an average authority coefficient of 0.81$±$0.04, indicating good credibility of our results. The expert questionnaire response rate was 100%, demonstrating excellent expert cooperation and reasonable, effective feedback.

For evaluating TCM symptom items, we comprehensively assessed expert opinion concentration and coordination across both rounds using sample mean, full-score ratio, standard deviation, and coefficient of variation. Sample means and full-score ratios showed consistent trends across items; items with higher means had relatively lower coefficients of variation, indicating unified expert understanding of TCM symptom characteristics.

Our findings demonstrate that compared with the first round, most symptom items showed decreased coefficient of variation in the second round, indicating converging expert opinions. Prioritized TCM symptom items with smaller coefficients of variation were: "Lumbar and back pain,""General bone pain,""Reduced height,""Humpback deformity,""Fracture occurrence within recent 5 years,""Body heaviness and fatigue," "Lassitude," "Heavy joint sensation," and "Tooth loosening and hair loss." Both rounds showed 基本一致的重要性排序, indicating good expert consensus.

3.2 Clinical Significance and Implications for Future Research

This study's primary innovation lies in conducting expert questionnaire analysis on TCM symptom assessment for high-risk osteoporosis populations in Lingnan region, forming preliminary expert consensus. Prioritized TCM symptom items are: "Humpback deformity"; "General bone pain"; "Fracture occurrence within recent 5 years"; "Lumbar and back pain"; "Reduced height"; "Heavy joint sensation"; "Body heaviness and fatigue"; "Lassitude"; and "Tooth loosening and hair loss."

Traditional TCM theory holds that the kidney governs bones and generates marrow; bone exhaustion with marrow reduction manifests as bone atrophy. Chronic consumptive and degenerative diseases like osteoporosis have core pathogenesis rooted primarily in kidney deficiency with secondary blood stasis. Kidney deficiency represents the fundamental cause, while blood stasis obstructing collaterals constitutes a key pathogenic factor. Based on this kidney deficiency and blood stasis essence, early diagnosis and treatment should address both "pain due to obstruction" and "pain due to malnourishment," following the principle of combined stasis-kidney treatment with kidney-tonifying and blood-activating methods. Clinicians have thus proposed the "Yushen Hezhi" (combined stasis-kidney treatment) academic concept to guide clinical practice [16-17].

Among the nine characteristic TCM symptom items for high-risk osteoporosis populations in Lingnan region, body heaviness and fatigue, lassitude, and heavy joint sensation potentially correlate with Lingnan dampness syndrome. Some experts also suggested supplementing items including "obesity," "persistent mild fever," "head heaviness as if wrapped," and "sticky mouth sensation," which require further validation. However, due to Lingnan region's unique climate, geography, and dietary habits, a constitutional pattern centered on dampness syndrome with distinct regional characteristics has gradually formed [18-19]. In Lingnan populations, pathogenic dampness is predominant; clinically, this often manifests as combined damp-heat with mixed deficiency-excess patterns, commonly referred to as "dampness" by frontline clinicians. Therefore, clinical diagnosis and treatment for Lingnan populations should clarify primary and secondary aspects with comprehensive consideration. Dampness syndrome has gradually become a core pathogenesis for various chronic diseases in Lingnan region, warranting further in-depth investigation.

4 Conclusion

Based on the Delphi method, this study comprehensively employed literature evidence-based research, expert surveys, and conference validation with open-ended suggestions and perspectives to reasonably summarize expert consensus opinions on TCM symptom assessment for high-risk osteoporosis populations in Lingnan region. These findings further improve previous research results and provide a reasonable foundation for subsequent early diagnosis and assessment

scale development.

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Author Contributions

ZENG Lingfeng and LIU Jun conceived and designed the study, analyzed and interpreted results, and drafted the manuscript. PAN Jianke, HUANG Hetao, HAN Yanhong, and LIANG Guihong implemented the study and conducted feasibility analysis. LUO Minghui, XIAO Xiao, XU Nanjun, ZHOU Guanghui, and ZHANG Xianquan collected and organized data. ZHAO Jinlong and OU Aihua performed statistical analysis. YANG Weiyi and LIANG Weixiong were responsible for quality control and manuscript review. ZENG Lingfeng and LIU Jun take overall responsibility for the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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Note: Figure translations are in progress. See original paper for figures.