Preparation of an Effective Traditional Chinese Medicinal Compound for Sleep-Aid Sacs in the Treatment of Insomnia in Older People: A Delphi Method Study

ABSTRACT

Objective: To establish an expert consensus on an optimal Traditional Chinese Medicine (TCM) compound for use in sleep-aid sacs to treat insomnia in older adults.

Methods: A three-round Delphi study was conducted with 12 TCM experts from a Class Three Grade A hospital in Guangzhou, China, from April to July 2021. An initial list of herbs was developed based on a literature review. Experts rated the importance of each herb on a 5-point Likert scale over three successive questionnaire rounds. Statistical analysis, including mean scores, coefficient of variation (CV), and Kendall's W coefficient, was used to assess the concentration and coordination of expert opinions.

Results: The effective questionnaire recovery rate was 100% across all three rounds. The final expert authority coefficient (Cr) was high at 0.94. The Kendall's W coefficients for the three rounds were 0.196, 0.341, and 0.158, respectively ($p < .05$), indicating strong and statistically significant coordination among experts. The CV for all selected herbs was less than 0.25, showing high opinion consistency. The final consensus process yielded a 10-herb compound: Dalbergia odorifera, Semen ziziphi spinosae, Chinese Eaglewood, Rose, Polygala, Radix Aucklandiae, Cassia Obtusifolia, Jasmine, Albiziae Cortex, and Polygoni Multiflori Caulis.

Conclusion: The Delphi method successfully facilitated a consensus among TCM experts, resulting in a scientifically derived and reliable herbal compound for treating insomnia in older people via sleep-aid sacs. This study provides a validated, non-invasive therapeutic option and a methodological reference for future research in TCM-based quality of life interventions.

Keywords: Delphi technique, insomnia, older people, quality improvement, traditional Chinese medicine (TCM)

Introduction

Insomnia in older adults is a prevalent and significant public health issue, affecting daily function and diminishing quality of life. National surveys in China indicate an insomnia rate as high as 74.1% among the elderly, with rates in nursing homes reaching between 54.5% and 64.9%.[1–4] This condition is more than a subjective feeling of insufficient sleep; it is a risk factor for chronic diseases, falls, depression,

and increased mortality, with a natural history that often leads to persistent symptoms if left untreated.[5–8] The aging global population underscores the urgent need for effective, safe, and accessible treatments for senile insomnia.[9]

From a Traditional Chinese Medicine (TCM) perspective, insomnia often stems from a disharmony of Yin and Yang, deficiency of qi and blood, and a lack of shen (a stable mental state).[10] While conventional pharmacology is a common treatment route, there is growing patient preference for TCM therapies due to their perceived milder side effects and holistic approach, a trend supported by systematic reviews showing the potential efficacy of TCM for primary insomnia.[11–13] Among these, sleep-aid aromatherapy and herbal sacs have gained popularity as non-invasive alternatives, with studies noting the positive effects of characteristic fragrances on sleep quality.[14],[15] However, the preparation of these remedies often lacks standardization and rigorous expert validation, posing risks to efficacy and safety. This gap highlights the need for a core outcome set for clinical trials in this area to ensure consistency and comparability of research.[16]

To address this gap, this study aimed to develop and validate an optimal TCM herbal compound specifically for use in sleep-aid sacs for older adults. The Delphi method was selected as a structured communication technique to systematically solicit expert opinions and achieve a reliable consensus.[17],[18] This approach is increasingly used in healthcare to establish clinical guidelines and standardize practices where evidence is emerging or complex, including the development of nursing programs and clinical management models.[19–21] By leveraging the collective knowledge of experienced TCM practitioners, this study sought to formulate a safe, effective, and scientifically grounded prescription to improve sleep quality and overall well-being in the geriatric population.

Methods

Study Design

This study employed a formal Delphi method to systematically gather and synthesize opinions from a panel of TCM experts. The process consisted of three iterative rounds of questionnaires administered between April 2021 and July 2021. Data were analyzed using SPSS Version 25.0. The study protocol was designed to ensure anonymity among experts while providing controlled feedback between rounds to guide the panel toward a final consensus, a key feature of the Delphi technique.[22,23]

Research Group

A research group comprising seven members was established to oversee the study. The group included experts in geriatric nursing, clinical nursing management, and nursing education, as well as four postgraduate nursing students with experience in

TCM. The group's responsibilities included defining the research topic, selecting the expert panel, designing the questionnaires, managing distribution and collection, establishing screening criteria for the herbal compound, and analyzing the results of each consultation round.

Expert Panel Selection

A panel of 12 TCM experts was recruited from a Class Three Grade A general hospital in Guangzhou, a tertiary-level institution serving as a major medical hub. This ensured the experts possessed a high degree of authority and representativeness. The inclusion criteria were designed to select for deep expertise, following best practices for Delphi panel formation.[17],[24] The criteria were: (1) over 10 years of experience in TCM diagnosis and treatment of older people; (2) a bachelor's degree or higher; (3) a middle or senior professional title; (4) recognized professional knowledge and rigorous academic work; and (5) commitment to participating in all three rounds of the study.

Delphi Process and Questionnaire

The Delphi process began with the research group conducting a literature review to identify the common pathogenesis of insomnia in older adults and to compile a draft list of frequently used Chinese herbs. This initial step is critical for grounding the first-round questionnaire in existing evidence, a common practice in Delphi studies aimed at developing clinical guidelines or evaluation systems.[16, 25, 26] This initial list formed the basis of the first-round questionnaire.

The expert questionnaire contained three parts:

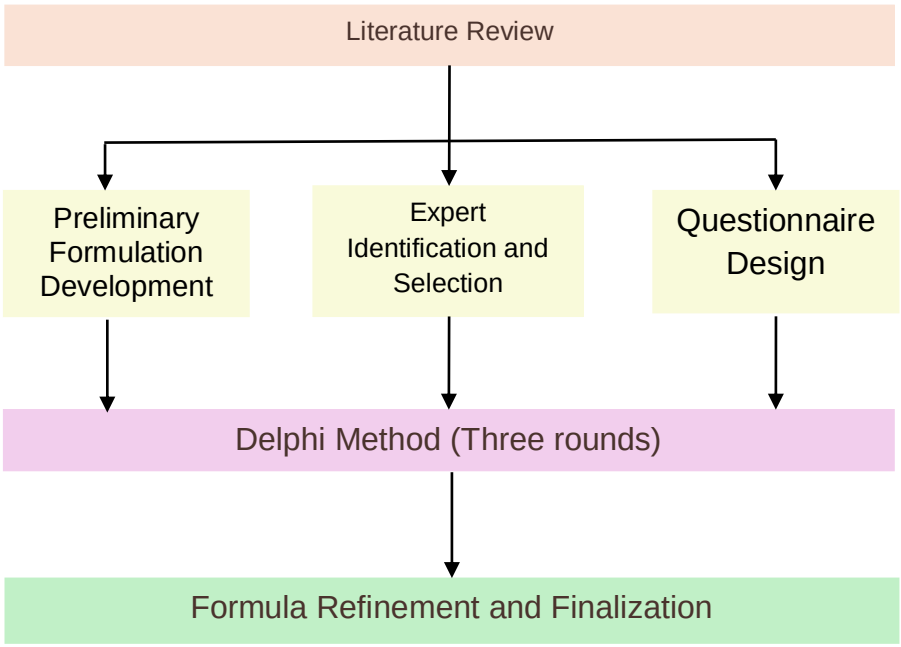
1. **Introduction:** Outlined the study's purpose, background, and significance, with instructions for completion.
2. **Herb Evaluation:** Listed TCM herbs for evaluation. Experts rated the importance of each herb for treating insomnia in the elderly using a 5-point Likert scale (1 = "not important" to 5 = "very important"). This section also included columns for recommended dosage and a suggestion field for experts to propose adding, removing, or modifying herbs.
3. **Expert Information:** Collected demographic data, professional experience, and self-rated familiarity with the topic (Cs) and the basis for their judgments (Ca). The basis of judgment (Ca) was weighted based on four factors: working experience, theoretical knowledge, reference to materials, and intuitive choice (Table 1).

Table 1. Assigned Weightings of Expert Judgment

Reasons of Judgment	Large	Medium	Small
Working experience	0.5	0.4	0.3
Theoretical knowledge	0.3	0.2	0.1
Reference to domestic and foreign materials	0.1	0.1	0.1
Intuitive choice	0.1	0.1	0.1

After each round, the research group analyzed the responses. A new questionnaire was then compiled for the subsequent round, which included a statistical summary of the previous round's results (mean scores, standard deviation) and a list of the revised herbs. This iterative feedback process continued until a stable consensus was achieved.

Figure 1 Traditional Chinese Medicine Formula Development Process



Statistical Analysis and Screening Criteria

Descriptive statistics were used to analyze the experts' background information. The reliability and validity of the Delphi process were assessed using several standard indicators widely accepted in survey research and Delphi methodology.[27,28]

1. **Expert Positive Coefficient:** The questionnaire recovery rate, with >70% considered very good.
2. **Expert Authority Coefficient (Cr):** Calculated as the arithmetic mean of the familiarity score (Cs) and the judgment basis score (Ca). A Cr > 0.7 indicates high authority.
3. **Concentration of Expert Opinions:** Measured by the mean importance score and the full score rate (K) for each herb.
4. **Coordination of Expert Opinions:** Measured by the coefficient of variation (CV) for each herb and Kendall's W for the overall expert panel. A CV ≤ 0.25 indicates good consistency. Kendall's W, with a significance level of $p < 0.05$, measures the concordance of the experts' rankings.

The screening criteria for retaining a herb in the prescription were a mean importance score > 4.0 and a CV ≤ 0.25, thresholds commonly used in similar Delphi-based construction studies to ensure consensus and relevance.[29,30]

Results

Background Information of the Experts

The 12 TCM experts who participated had an average age of 47 years and an average of 22 years of work experience. All experts were actively engaged in the clinical treatment of older people. Of the panel, 75% (n=9) had ≥15 years of work seniority, and 66.7% (n=8) held senior professional titles. The panel's educational background included one doctorate, three master's degrees, and eight bachelor's degrees. Detailed demographic data are presented in Table 2.

Table 2. Background Information of Experts (n=12)

Project	Group	Number of people	Constituent ratio
Gender	Male	7	58.3%
	Female	5	41.7%

Age	30 to 39 years old	2	16.7%
	40 to 49 years old	3	25.0%
	50 or higher	7	58.3%
Education	Bachelor's degree	8	66.7%
	Master's degree	3	25.0%
	Doctoral degree	1	8.3%
Professional title	Attending physician	4	33.3%
	Associate senior doctor	6	50.0%
	Chief physician	2	16.7%
Work seniority	<15 years	3	25.0%
	≥15 years	9	75.0%
Clinical diagnosis and treatment of older people	Yes	12	100.0%

Expert Positive Coefficient and Degree of Authority

The study achieved a 100% effective recovery rate for the questionnaires in all three rounds (Table 3), indicating a high level of engagement and motivation from the expert panel. The degree of expert authority was calculated after the first round. The judgment basis coefficient (Ca) was 0.96, and the familiarity coefficient (Cs) was 0.92. The overall expert authority coefficient (Cr) was 0.94, demonstrating that the panel possessed a high level of expertise and authority on the research topic (Tables 4 and 5).

Table 3. Effective Recovery Rates of Expert Consultation Questionnaires

Consultation phase	Number of questionnaires issued	Number recovered	Response rate (%)	Effective recovery rate (%)
First round	12	12	100	100
Second round	12	12	100	100
Third Round	12	12	100	100

Table 4. Frequency Distribution of Expert Judgment

Reasons of judgment	Large	Medium	Small
Working experience	10	2	0
Theoretical knowledge	9	3	0
Reference to domestic and foreign materials	4	4	4
Intuitive choice	2	4	6

Note: Ca = (10×0.5+2×0.4+9×0.3+3×0.2+0.4+0.4+0.4+0.2+0.4+0.6) ÷ 12 = 0.96

Table 5. Frequency Distribution of Experts' Familiarity with the Consultation Contents

Degree of familiarity	Very familiar	Quite familiar	Generally familiar	Unfamiliar	Very unfamiliar
Headcount	7	5	0	0	0

Note: Cs = (7+5×0.8) ÷ 12 = 0.92

Coordination and Concentration of Expert Opinions

The coordination of expert opinions was robust. The CV values for all herbs included in the final prescription ranged from 0.081 to 0.220, well below the threshold of 0.25, indicating strong agreement on the importance of individual herbs. The Kendall's W coefficients for the three rounds were 0.196, 0.341, and 0.158, and the χ^2 test was statistically significant ($p < 0.05$) for each round (Table 6). This confirms a high degree of overall coordination among the experts' evaluations.

Table 6. Degree of Coordination of Expert's Opinion

Consultation phase	**Kendall's W**	**χ^2**	**p**
First round	0.196	23.531	<0.05
Second round	0.341	40.972	<0.05
Third Round	0.158	17.094	<0.05

The concentration of expert opinions, reflected by the mean importance scores, increased with each round. In the final round, mean scores for the selected herbs ranged from 4.08 to 4.83. Herbs such as Rose, Chinese Eaglewood, Dalbergia odorifera, and Semen ziziphi spinosae received full score rates (K) of ≥50%, indicating a very high degree of consensus on their importance (Table 7).

Table 7. Expert's Herb Content and Importance Scores (Final Round)

Herb	**Mean ± Standard Deviation**	**CV**	**K**
Dalbergia odorifera	4.42 ± 0.79	0.179	58.3%
Semen ziziphi spinosae	4.42 ± 0.79	0.179	58.3%
Chinese Eaglewood	4.67 ± 0.49	0.105	66.7%
Rose	4.83 ± 0.39	0.081	83.3%
Polygala	4.25 ± 0.87	0.204	50.0%
Radix Aucklandiae	4.08 ± 0.90	0.220	33.3%

Cassia Obtusifolia	4.17 ± 0.58	0.138	25.0%
Jasmine	4.42 ± 0.52	0.116	41.6%
Albiziae Cortex	4.50 ± 0.52	0.116	50.0%
Polygoni Multiflori Caulis	4.33 ± 0.65	0.150	41.6%

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189 Modification and Finalization of the TCM Compound

190 Based on the screening criteria and expert feedback, the initial list of herbs was
191 systematically refined over the three rounds. Herbs with a mean score < 4.0 or a CV
192 > 0.25 were removed. In the first and second rounds, experts suggested
193 replacements for several herbs to better align with the therapeutic goal, which were
194 adopted after group discussion (Table 8). For example, Borneol was replaced by
195 Dalbergia Odorifera. After three rounds of consultation, a final 10-herb compound
196 was established (Table 7).

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199 Table 8. Details of Expert Opinions on Herb Modification

Consultation phase	**Expert opinion**	**Whether to adopt**
First round	Light Bamboo Leaves was replaced by Polygoni Multiflori Caulis	Yes
First round	Borneol was replaced by Dalbergia Odorifera	Yes
First round	Huanglian was replaced by Semen Ziziphi Spinosae	Yes
First round	Cinnamon was replaced by Agarwood	Yes
First round	Kaempferi was replaced by Roses	Yes
First round	Xinyi was replaced by Polygala	Yes

Second round	White Cardamom was replaced by Radix Aucklandiae	Yes
Second round	The dose of Ganoderma atrum should be reduced	Yes
Second round	Xiangfu was replaced by Cassia Obtusifolia	Yes
Second round	Atractylodes was replaced by Jasmine	Yes
Second round	Acorus tatarinowii was replaced by Albizia Julibrissin	Yes
Second round	Polygoni Multiflori Caulis was replaced by Angelica sinensis	No
Second round	The Polygala was changed to Frangipani or Mint	No

Discussion

This study successfully utilized the Delphi method to establish an expert consensus on a TCM compound for treating insomnia in older adults via sleep-aid sacs. The high questionnaire recovery rate (100%), strong expert authority coefficient (0.94), and significant coordination coefficients (Kendall's W, $p < 0.05$) confirm the reliability and scientific validity of the process. The findings demonstrate that the Delphi technique is a robust tool for standardizing TCM practices and enhancing the quality of care for conditions where individualized treatment is paramount, a conclusion supported by its use in developing other complex healthcare models.[27,31,32]

The final 10-herb prescription represents a synthesis of classical TCM theory, modern literature, and extensive clinical experience. The selection process, guided by iterative expert feedback, ensured that the chosen herbs were not only considered effective but also safe for the geriatric population, who are often vulnerable to adverse drug reactions. The resulting compound aims to restore the balance of Yin and Yang and pacify the shen (spirit), addressing the root pathogenesis of insomnia in TCM. This aligns with modern research suggesting that multi-herb, multi-target TCM formulas, such as the classic Suanzaoren decoction, can be effective for complex conditions like insomnia.[33,34]

The development of a non-invasive therapy like a sleep-aid sac is a significant step in improving the quality of life for older adults. It avoids the systemic side effects associated with oral medications and offers a gentle, patient-friendly treatment modality, which is particularly important in geriatric care where polypharmacy is a concern.[14,35] This approach is consistent with a broader shift in healthcare toward patient-centered and minimally invasive interventions. The finalized compound has since been tested in a nursing home setting in Guangzhou, achieving good clinical efficacy and demonstrating the practical value of this research, similar to other TCM-based clinical studies.[36–38]

Limitations

This study has several limitations. First, the expert panel was recruited from a single hospital in Guangzhou, China. While the experts were highly qualified, this may limit the generalizability of the findings to other regions of China or internationally, where TCM practices may differ. Future research should involve a more geographically diverse panel of experts to validate and potentially refine the compound. Second, the Delphi method is based on expert opinion, not a randomized controlled trial. While the consensus provides a strong foundation, the clinical efficacy and safety of the final compound must be rigorously evaluated in large-scale, multi-center clinical trials. Finally, this study focused on formulating the compound using the TCM inheritance assistance platform; further research is needed to standardize the dosage and preparation of the sleep-aid sacs themselves.[39]

Conclusion

With the global population aging, the incidence of insomnia among older adults is a growing concern that significantly impacts healthcare quality. This study successfully applied the Delphi method to formulate a reliable, scientifically-grounded TCM herbal compound for use in sleep-aid sacs. The process demonstrated high levels of expert consensus, authority, and coordination. The resulting 10-herb prescription offers a promising, non-invasive therapeutic option for managing insomnia in older people. These findings provide a valuable reference for the clinical application of TCM in geriatric care and establish a methodological framework for developing other evidence-based TCM interventions aimed at improving patient quality of life.

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Conflict of Interest

All authors declare no conflicts of interest.

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References

1. Han F, Tang X, Zhang B. Chinese guidelines for the diagnosis and treatment of insomnia in China. Natl Med J China. 2017;97(24):1844-1856.
2. Zhang J, Feng W, Lu Z. Etiology and treatment of senile insomnia research progress. World of clinical medicine. 2018;33(4):229-234.
3. Wu W, Jiang X, Zhang X, et al. The status and influencing factors of sleep quality for institutional older people in Fuzhou. Chin J Nurs. 2016;51(3):352-355.
4. Yang JJ, Cai H, Xia L, et al. The prevalence of depressive and insomnia symptoms, and their association with quality of life among older adults in rural areas in China. Frontiers in psychiatry. 2021;12: 727939.
5. Jaussent I, Bouyer J, Ancelin ML, et al. Insomnia and daytime sleepiness are risk factors for depressive symptoms in the elderly. Sleep. 2011;34(8):1103-1110.
6. Wilfred R, Pinquart M, Conner K. Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. J Clin Psychiatry. 2012;73(9):e1160-e1167.
7. Chen TY, Lee S, Buxton OM. A Greater Extent of Insomnia Symptoms and Physician-Recommended Sleep Medication Use Predict Fall Risk in Community-Dwelling Older Adults. Sleep. 2017;40(11).
8. Gureje O, Oladeji BD, Abiona T, et al. The natural history of insomnia in the Ibadan study of ageing. Sleep. 2011;34(7):965–973.
9. Amidi A, Buskbjerg CDR, Christensen DS, et al. Sleep and Mental Health in the Ageing Population[M]//Brain and Mental Health in Ageing. Cham: Springer Nature Switzerland. 2024;395-417.
10. Zhang X, Zhang S, Tan S, et al. Integrative Systems Biology in Insomnia: Bridging Traditional Chinese Medicine and Modern Science. Chinese Journal of Analytical Chemistry. 2025;100564.
11. Li S, Xue Q, Zhong Y, et al. Research trends in complementary and alternative treatments for insomnia over the past decade: a bibliometrics analysis. Medicine. 2023;102(29): e34346.

12. Wang J, Chen Y, Zhai X, et al. Visualizing research trends and identifying hotspots of traditional Chinese medicine (TCM) nursing technology for insomnia: A 18-years bibliometric analysis of web of science core collection. Frontiers in Neurology. 2022;13: 816031.

13. Sarris J, Byrne GJ. A systematic review of insomnia and complementary medicine. Sleep Med Rev. 2011;15(2):99-106.

14. Al-Worafi YM, Kifli N, Alsergi WM, et al. Evidence-Based Complementary, Alternative and Integrated Medicine and Efficacy and Safety: Sleep Disorders. Handbook of Complementary, Alternative, and Integrative Medicine. CRC Press. 2025;26-47.

15. Zhao FY, Xu P, Kennedy GA, et al. Identifying complementary and alternative medicine recommendations for insomnia treatment and care: a systematic review and critical assessment of comprehensive clinical practice guidelines. Frontiers in public health. 2023;11: 1157419.

16. Wu Q, Chen X, Gan G, et al. Visual analysis and evaluation of clinical research on Traditional Chinese medicine compounds in treating insomnia of Yin deficiency syndrome. Journal of Ethnopharmacology. 2022;298: 115669.

17. Humphrey-Murto S, Varpio L, Gonsalves C, Wood TJ. Using consensus group methods such as Delphi and nominal group in medical education research. Med Teach. 2017;39(1):14-19.

18. Ismail G, Taliep N. The Delphi Method. Handbook of social sciences and global public health. Cham: Springer International Publishing. 2023;985-1003.

19. Diamond IR, Grant RC, Feldman BM, et al. Defining consensus: a systematic review recommends method-specific criteria for reporting of Delphi studies. J Clin Epidemiol. 2014;67(4):401-409.

20. Varndell W, Fry M, Lutze M, et al. Use of the Delphi method to generate guidance in emergency nursing practice: A systematic review. International emergency nursing. 2021;56: 100867.

21. Mosadeghrad AM, Ghazanfari F. Developing a hospital accreditation model: a Delphi study. BMC Health Services Research. 2021;21(1): 879.

22. Hohmann E, Beaufils P, Beiderbeck D, et al. Guidelines for Designing and Conducting Delphi Consensus Studies: An Expert Consensus Delphi Study. Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2025.

23. Barkhordari Ahmadi F , Esmaeeli B , Shariat Moghani S , et al . A Literature Review of Group Decision -Making: The Case Study of Delphi Method. Medical Education Bulletin. 2023;4(4): 824-833.

24. Furtado L, Coelho F, Pina S, et al. Delphi technique on nursing competence studies: A scoping review[C]//Healthcare. MDPI, 2024, 12(17): 1757.

25. Zhang MQ, Xu DM, Gao J, et al. Construction of psychiatric protective restraint implementation evaluation scale based on Delphi method. Nurs Res. 2022;36(14):2466-2470.

26. Chang SS, Bochner BH, Chou R, et al. TREATMENT OF NON-METASTATIC MUSCLE-INVASIVE BLADDER CANCER: AUA/ASCO/ASTRO/SUO GUIDELINE. 2017; Amended 2020,2024. 2024.

27. Changhao L, Guanxiang YIN, Yaqi W, et al. Application of Delphi Method in the Development and Revision of Clinical Practice Guidelines of Traditional Chinese Medicine: Process and Suggestions. Medical Journal of Peking Union Medical College Hospital. 2023;14(5): 1084-1090.

28. Shi X, He X, Liu Q, et al. Conducting and reporting the Delphi method in traditional Chinese medicine syndrome diagnosis research: A cross-sectional analysis. Heliyon. 2024;10(3).

29. Xue L, Wu B, Xiao X, et al. Construction of a quality evaluation index system for assessing a breast cancer self-management intervention on the basis of a three-dimensional quality evaluation model: A Delphi study. 2025.

30. Hu Y, Wang F, Luo Y, et al. Construction of online and offline training program for gynecological specialist nurses. Nurs Res. 2021;36(08):1359-1364.

31. Wu J, Jia X, Liu G. Construction of continuous nursing model for children with severe viral encephalitis sequelae based on Delphi method. Nurse Educ J. 2018;(12):1074-1077.

32. Sun Y, Wang P, Yang G, et al. Improving delphi process in acupuncture decision making: overall descriptions and quality assessment of delphi reports. Journal of Multidisciplinary Healthcare. 2024;4243-4256.

33. Liu J, Shi JL, Guo JY, et al. Anxiolytic-like effect of Suanzaoren–Wuweizi herb-pair and evidence for the involvement of the monoaminergic system in mice based on network pharmacology. BMC Complementary Medicine and Therapies. 2023;23(1): 7.

34. Wang Q, Wang D, Lv Y, et al. Traditional Chinese Medicine in the Management of Anxiety Disorders: A Narrative Review of Theoretical Foundations, Clinical Applications, and Modern Integrative Approaches[J]. Neuropsychiatric Disease and Treatment. 2025;1215-1233.

35. Shi X, Chen L, Li W, et al. Research progress in the prevention and treatment of insomnia with classical prescriptions. Zhong nan da xue xue bao. Yi xue ban Journal of Central South University. Medical Sciences. 2023;48(10): 1494-1505.

36. Wang CY, Wang RJ, Zhang YJ, et al. Integration of Chinese herbal medicines and exercise for insomnia: a systematic review and meta-analysis. TMR Non-Drug Ther. 2023;6(3): 12.

37. Zhuang J, Wu J, Fan L, Liang C. Observation on the Clinical Efficacy of Traditional Chinese Medicine Non-Drug Therapy in the Treatment of Insomnia: A Systematic Review and Meta-Analysis Based on Computer Artificial Intelligence System. Comput Intell Neurosci. 2022;(1):1081713.

38. Nashwan AJ, Rao AG. Integrating traditional Chinese medicine and artificial intelligence for insomnia: A promising frontier. Brain Behavior and Immunity Integrative. 2024;7: 100071.

39. He C, Fang Z, Wu H, et al. A flexible and dissolving traditional Chinese medicine microneedle patch for sleep-aid intervention. Heliyon. 2024;10(12).