ChinaRxiv 中X

AI translation · View original & related papers at
chinarxiv.org/items/chinaxiv-202307.00017

Research on the Construction of an Optimal Acupuncture Intervention Protocol for Migraine Based on Entropy-Weighted TOPSIS Method (Postprint)

Authors: Wang Zhe, Dong Zhihao, Zheng Hao, Kong Wencheng, Zhang Yukuan, Zhang Qiuyue, Han Jing, Han Jing

Date: 2023-07-04T00:00:00+00:00

Abstract

Background With the accumulation of high-quality evidence, the clinical efficacy of acupuncture for migraine has gradually gained recognition. Currently, a considerable number of acupuncture clinical studies in China have employed clinical trial methodologies to highlight and validate the advantages of various acupuncture intervention protocols. Integrating and screening these advantageous protocols to guide clinical practice has emerged as a novel research topic in acupuncture.

Objective To employ the entropy-weighted Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) based on Meta-analysis for multi-criteria decision-making (MCDM), screen advantageous acupuncture protocols for migraine from multiple dimensions, and explore methodological approaches for constructing advantageous acupuncture protocols.

Methods Computerized searches were conducted for randomized controlled trials (RCTs) on acupuncture for migraine published before April 2022 in Wanfang Data Knowledge Service Platform, VIP, CNKI, Chinese Biomedical Literature Database, PubMed, Web of Science, and Embase. Two researchers independently screened literature and extracted basic characteristics (author, publication year, sample size, cure rate, effective rate, and Visual Analogue Scale [VAS] score, etc.), and assessed RCT quality using the modified Jadad scale. Acupuncture protocols for migraine were summarized according to the characteristics of included RCTs, and Meta-analysis was performed on different protocols. Based on Meta-analysis results, the relative risk (RR) of cure rate and effective rate and the mean difference (MD) of VAS were extracted for each protocol, and the weighted mean values of treatment sessions and modified Jadad scale scores

were calculated using each study's sample size as weights. These metrics were incorporated into MCDM analysis, with the entropy weight method employed to determine the weights of different decision indicators. Finally, the TOPSIS method was utilized to screen advantageous acupuncture protocols for migraine.

Results A total of 17 RCTs were included, which were summarized into 8 acupuncture protocols for migraine (Tongyuan acupuncture, Zhishen six points, Bianbian acupuncture, conventional acupuncture, gallbladder meridian acupoints, head acupoints, penetrating needling, and Siguan points). The final TOPSIS evaluation results of each protocol indicated that the acupuncture protocol focusing on head acupoints was optimal. This advantageous protocol primarily employs Fengfu, Touwei, Toulinqi, Taiyang, Shuaigu, and Fengchi acupoints on the head, administered once daily or every other day, with an average of 11 treatment sessions. Its principal advantages include short treatment duration and significant reduction in VAS pain scores.

Conclusion The advantageous acupuncture protocol for migraine screened and constructed in this study may provide a reference for clinical application, and the entropy-weighted TOPSIS method based on Meta-analysis offers novel insights for constructing advantageous acupuncture protocols.

Full Text

Construction of Optimized Treatment Plan of Acupuncture for Migraine Based on Entropy Weight-TOPSIS Method

Authors: WANG Zhe[1], DONG Zhihao[1], ZHENG Hao[1], KONG Wencheng[2], ZHANG Yukuan[1], ZHANG Qiuyue[1], HAN Jing[3]*

Affiliations: 1. Institute of Acumox and Tuina, Shandong University of Traditional Chinese Medicine, Jinan 250013, China 2. Central Hospital Affiliated to Shandong First Medical University, Jinan 250013, China 3. Affiliated Hospital of Shandong University of Traditional Chinese Medicine, Jinan 250013, China

*Corresponding author: HAN Jing, Associate chief physician/Associate professor; E-mail: hanjing0127@163.com

---

Abstract

Background: With the accumulation of high-quality evidence, the clinical effectiveness of acupuncture for migraine has gained increasing recognition. Numerous acupuncture clinical studies in China have sought to highlight and validate various acupuncture intervention protocols through clinical trials. Integrating and selecting these advantageous protocols to guide clinical practice has become a new focus in acupuncture research.

Objective: To conduct multicriteria decision making (MCDM) using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method based on meta-analysis, screen for optimized treatment plans of acupuncture for migraine, and explore methodological approaches for constructing acupuncture optimized treatment plans.

Methods: We systematically searched Wanfang Data Knowledge Service Platform, VIP, CNKI, SinoMed, PubMed, Web of Science, and Embase databases for randomized controlled trials (RCTs) on acupuncture treatment for migraine published before April 2022. Two researchers independently screened literature and extracted basic characteristics including authors, publication year, sample size, cure rate, efficiency rate, and Visual Analogue Scale (VAS) scores. The quality of RCTs was assessed using the modified Jadad scale. Acupuncture treatment plans for migraine were summarized based on the characteristics of included RCTs, and meta-analyses were performed for each plan. From the meta-analysis results, we extracted the relative risk (RR) of cure and efficiency rates and the mean difference (MD) of VAS scores for each plan. Weighted averages of treatment frequency and modified Jadad scale scores were calculated using sample size as weights. All these data were incorporated into MCDM analysis, with the entropy weight method used to determine the weights of different decision criteria. Finally, the TOPSIS method was applied to screen for optimized acupuncture treatment plans for migraine.

Results: A total of 17 RCTs were included and categorized into eight types of acupuncture treatment plans (Tongyuan acupuncture, Six Spirit Points, Bone-Nearby Acupuncture, Conventional Acupuncture, Gallbladder Meridian Acupoints, Head Acupoints, Penetration Needling Method, and Siguan Acupoints) based on meta-analysis results. The TOPSIS evaluation indicated that the treatment plan focusing primarily on head acupoints was optimal. This optimized protocol involves needling head acupoints including Fengfu (GV16), Touwei (ST8), Toulinqi (GB15), Taiyang (EX-HN5), Shuaigu (GB8), and Fengchi (GB20) once daily or every other day, with an average of 11 treatment sessions. Its main advantages include shorter treatment duration and significant reduction in VAS pain scores.

Conclusion: The optimized acupuncture treatment plan for migraine identified in this study can provide a reference for clinical application. The entropy weight-TOPSIS method based on meta-analysis offers a novel approach for constructing optimized acupuncture treatment plans.

Keywords: Migraine Disorders; Acupuncture; Optimized treatment plan; Multicriteria decision making; TOPSIS methods; Meta-analysis

---

Introduction

Migraine is the second most common neurological disease globally, characterized by recurrent moderate to severe throbbing pain lasting 4-72 hours, typically unilateral, and accompanied by nausea, vomiting, photophobia, and phonophobia. According to the Global Burden of Disease Study, migraine causes more disability than all other neurological diseases combined and often coexists with conditions such as depression, epilepsy, stroke, and myocardial infarction, severely impacting patients' quality of life. Migraine treatment includes acute therapy for attacks and preventive therapy to reduce frequency. While evidence supports the efficacy of nonsteroidal anti-inflammatory drugs, opioids, triptans, and ergotamine, these medications may cause adverse events including hypotension, depression, drowsiness, and gastrointestinal intolerance, leading to poor patient compliance.

Randomized controlled trials and systematic reviews have demonstrated that acupuncture plays an active role in migraine treatment with minimal adverse events. As evidence accumulates, numerous acupuncture treatment protocols for migraine have been published. Chinese acupuncture clinical research has shifted from non-inferiority and equivalence studies to superiority studies aimed at validating the advantages of different acupuncture interventions through clinical trials. Consequently, how to screen for optimal protocols has become a new challenge in evidence-based acupuncture research. Some scholars have approached this through network meta-analysis and data mining to identify superior therapies and acupoint selection protocols. However, network meta-analysis only compares clinical efficacy and sample sizes across studies without integrating indicators such as intervention duration and evidence quality, limiting its clinical applicability to some extent.

Multicriteria decision making (MCDM) is recognized as a complex decision-making tool involving both quantitative and qualitative factors and has been widely applied in health technology assessment. Among MCDM methods, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) proposed by Hwang and Yoon in 1981 is the most commonly used. In recent years, some researchers have applied MCDM to screen optimal protocols for post-stroke shoulder-hand syndrome, vascular dementia, chronic fatigue syndrome, post-stroke depression, and lateral femoral cutaneous neuritis. These studies typically use the treatment protocol from a single RCT's experimental group as the research object, with effectiveness rate, intervention cycle, and literature quality as evaluation indicators. However, methodologically, these studies rarely consider the control group situation, and each treatment protocol is based on only one study, resulting in poor comparability between different protocols.

In acupuncture clinical research for migraine, each intervention protocol is often supported by multiple RCTs. Based on this, our study proposes using meta-analysis to combine studies with the same intervention protocol, using the effect

sizes (relative risk and mean difference) from meta-analysis as efficacy evaluation indicators, incorporating them into MCDM analysis, using the entropy weight method to determine the weights of different decision indicators, and finally applying the TOPSIS method for comprehensive analysis with research quality and intervention frequency indicators to screen for optimal acupuncture protocols for migraine. This approach aims to provide references for clinical acupuncture treatment of migraine and offer methodological insights for future research on constructing acupuncture optimized treatment plans.

Methods

1.1 Literature Search Two researchers independently searched Wanfang Data Knowledge Service Platform, VIP, CNKI, SinoMed, PubMed, Web of Science, and Embase databases for RCTs on acupuncture treatment for migraine published before April 2022. The search strategy combined subject terms with free terms. Chinese search terms included "针刺" (acupuncture), "电针" (electroacupuncture), and "偏头痛" (migraine). English search terms included "acupuncture," "migraine," and "hemicrania." Reference lists were manually reviewed to avoid missing relevant literature.

1.2 Quality Assessment The modified Jadad scale was used to assess literature quality. Included RCTs were scored on four aspects: random sequence generation, allocation concealment, blinding, and dropout/withdrawal, with a total score of 7 points. Scores of 4-7 were considered high-quality evidence.

1.3 Inclusion Criteria Studies were included if they met the following criteria: (1) Study type: RCTs on acupuncture for migraine; (2) Participants: migraine patients with no restrictions on case source, age, gender, or disease duration; (3) Interventions: the experimental group used acupuncture therapy (with no restrictions on needle type, acupoint selection, needle retention time, or treatment course), while the control group received conventional Western medicine treatment; (4) Outcome indicators: cure rate and efficiency rate as primary outcomes, and headache intensity (Visual Analogue Scale) as a secondary outcome.

1.4 Exclusion Criteria Studies were excluded if they: (1) were unavailable in full text, duplicate publications, or had incomplete data; (2) were Chinese journal articles with duplicate English versions; or (3) used moxibustion, bloodletting, cupping, or other traditional Chinese medicine therapies, or combined acupuncture with other Chinese or Western medicine treatments in the experimental group.

1.5 Data Extraction EndNote X9 software was used to remove duplicates. Two independent researchers strictly followed the inclusion and exclusion crite-

ria for literature screening. Disagreements were resolved through discussion or by consulting a third researcher. After initial screening based on titles and abstracts, full texts were obtained and further reviewed to exclude irrelevant literature. Information extracted from the final included studies comprised authors, publication year, experimental and control group treatment protocols, sample size, and clinical efficacy indicators (cure rate, efficiency rate, and VAS). The modified Jadad scale score was calculated for each study.

1.6 Treatment Plan Construction Criteria Included studies were categorized into different protocols based on their prominent features. Studies that combined local and distal acupoint selection without special techniques or specific acupoints were classified as conventional acupuncture protocols. Studies with special acupoint selection or special needling techniques (such as penetration needling) were categorized according to their distinctive characteristics.

1.7 Statistical Analysis R version 4.1.2 was used for meta-analysis of different protocols. A fixed-effects model was adopted if no significant heterogeneity existed among studies ($P \geq 0.1$, $I^2 \leq 50\%$), while a random-effects model was used if significant heterogeneity was present ($P < 0.1$, $I^2 > 50\%$). Statistical significance was set at $P < 0.05$. For protocols with multiple original studies, meta-analysis was used to calculate the RR of cure and efficiency rates and the MD of VAS scores for each protocol. Weighted averages of treatment frequency and modified Jadad scale scores were calculated using sample size as weights (since sample size was already used as a weight in the effect size merging process for treatment frequency, cure rate, efficiency rate, VAS, and modified Jadad scale scores, it did not need to be included as a separate decision indicator). The constructed protocols served as research objects for MCDM. A decision matrix was initially constructed, and linear proportional transformation was used to standardize indicators of different magnitudes. Origin 2021 software was used to draw heat maps for visual analysis of each protocol's advantages. The entropy weight method was employed to determine the weights of different decision indicators. According to the principle of entropy, the smaller the entropy value, the greater the indicator's variance degree, and the greater its influence on protocol evaluation. Finally, the TOPSIS method was used to calculate the positive and negative ideal solutions for each protocol, as well as the distances and relative closeness degrees between each protocol's indicators and the ideal solutions. Protocols were screened based on relative closeness degree, with larger values indicating greater distance from the negative ideal solution and smaller distance from the positive ideal solution, thus representing better protocols.

Results

2.1 Literature Search Results The initial search yielded 1,656 articles (108 from CNKI, 113 from Wanfang, 430 from VIP, 499 from SinoMed, 111 from

PubMed, 138 from Web of Science, and 257 from Embase). After removing duplicates, 953 articles remained. Following title and abstract screening, 148 full-text articles were obtained. After further full-text review, 17 articles were ultimately included [25-41].

2.2 Basic Characteristics of Included Studies Among the 17 included studies, six used conventional acupuncture in the experimental group [25,30-31,33,36,39], two focused on Gallbladder Meridian acupoints [26,41], two emphasized head acupoints [29,32], three used penetration needling [28,34-35], and one each used Tongyuan acupuncture [40], Six Spirit Points [37], Bone-Nearby Acupuncture [38], and Siguan acupoints [27]. The control groups were treated with aspirin [36], acetaminophen [39], nimodipine [32,38], or flunarizine [25-31,33-35,37,40-41]. Jadad scores varied across studies, with six studies scoring 4 or above [27,29,35,37,39-40]. As this study aimed to explore optimal protocols, Jadad scores were used only as reference indicators rather than exclusion criteria. Detailed characteristics are presented in Table 1 .

2.3 Meta-Analysis Results The conventional acupuncture protocol comprised six studies [25,30-31,33,36,39], the Gallbladder Meridian acupoints protocol two studies [26,41], the head acupoints protocol two studies [29,32], and the penetration needling protocol three studies [28,34-35]. Meta-analysis was used to combine effect sizes for cure rate, efficiency rate, and VAS scores for these protocols, with results shown in Table 2 . The remaining four protocols (Tongyuan acupuncture [40], Six Spirit Points [37], Bone-Nearby Acupuncture [38], and Siguan acupoints [27]) were each supported by a single study, for which RR and MD were calculated directly. Based on intervention characteristics, the 17 included studies [25-41] were summarized into eight treatment protocols, with decision indicator results for each protocol presented in Table 3 .

2.4 TOPSIS Evaluation Process and Results

2.4.1 Establishing Research Objects and Evaluation Indicators The eight intervention protocols identified above served as research objects for MCDM. For each protocol, the RR of cure rate, RR of efficiency rate, MD of VAS, and modified Jadad scale score (weighted average) were considered benefit-type indicators, while treatment frequency (weighted average) was considered a cost-type indicator.

2.4.2 Constructing the Decision Matrix A decision matrix A was constructed for each protocol (Formula 1), comprising five decision indicators across eight alternative protocols.

2.4.3 Standardized Matrix After linear proportional transformation, the mean data ranged between 0 and 1 while preserving the relative importance of each indicator, resulting in matrix R (Formula 2). The visualized heat map

of the standardized decision matrix revealed that efficiency rate showed little variation across protocols, while treatment frequency, VAS, and modified Jadad scores varied considerably (Figure 1 [Figure 1: see original paper]).

2.4.4 Determining Indicator Weights Using Entropy Weight Method The entropy values, variance degrees, and weight coefficients of each decision indicator are shown in Table 4 . The results indicated that cure rate and efficiency rate had larger entropy values and smaller variance degrees, leading the entropy weight method to assign lower weights to these indicators. Conversely, treatment frequency, VAS, and modified Jadad scores had smaller entropy values and larger variance degrees, thus receiving higher weight coefficients.

2.4.5 Weighted Standardized Matrix The standardized matrix was weighted using the coefficients obtained from the entropy weight method, yielding weighted matrix V (Formula 3).

2.4.6 Final TOPSIS Results Based on weighted matrix V, the positive and negative ideal solutions for each evaluation indicator were determined (Table 5). The final TOPSIS evaluation results for each protocol are presented in Table 6 . The results showed that the head acupoint-based protocol provided by Lu Jinrong et al. [32] and Yang Jia et al. [29] was optimal, with a treatment frequency of once daily or every other day, an average of 11 treatment sessions, and main acupoints including Fengfu (GV16), Touwei (ST8), Toulinqi (GB15), Taiyang (EX-HN5), Shuaigu (GB8), and Fengchi (GB20), with electroacupuncture optionally applied based on patient condition.

Discussion

3.1 Previous Applications of MCDM in Acupuncture and Methodological Exploration in This Study In medical practice, healthcare decision-makers often face the challenge of selecting optimal treatment protocols from available options. The growing body of evidence in acupuncture research provides a foundation for screening optimal protocols. Many scholars have used network meta-analysis to compare different acupuncture protocols from an efficacy perspective, offering feasible approaches for protocol selection. However, with increasing clinical application demands, comparison based solely on efficacy while ignoring intervention duration and costs makes comprehensive evaluation of different protocols difficult. Recognizing this limitation, Professor Du Yuanhao's team introduced multicriteria decision making into the construction of acupuncture optimized treatment plans [18-19,21-22,44]. In recent years, researchers have gradually applied MCDM methods to identify optimal protocols for various conditions including occipital neuralgia [44], acne [45], lateral femoral cutaneous neuritis [22], vascular dementia [19], chronic fatigue syndrome [20], and post-stroke shoulder-hand syndrome [18]. These studies

typically used sample size, literature quality scores, cure rate, and efficiency rate as benefit indicators, and treatment duration as a cost indicator.

MCDM methods address the limitations of previous approaches that evaluated acupuncture protocols from a single efficacy perspective, opening new avenues for constructing acupuncture optimized treatment plans. However, previous studies had several methodological limitations: they used single RCTs with small sample sizes and potential bias; their decision objects were treatment protocols from each RCT's experimental group without considering the control group situation; and different RCTs had heterogeneous baselines due to variations in patient conditions, timing, and settings, making efficacy comparisons between experimental groups incomparable.

Building upon previous research, this study made the following methodological innovations considering the actual situation of acupuncture clinical research for migraine:

First, we achieved protocol construction by combining RCTs using the same intervention method through meta-analysis, which expanded the sample size for each treatment protocol while reducing bias from individual RCTs. Second, we optimized decision indicators. RCTs maintain baseline consistency and avoid confounding bias, allowing us to use control groups to correct for inter-group heterogeneity. Therefore, we used meta-analysis effect sizes (RR and MD) as benefit indicators for efficacy, enhancing comparability between different studies. Additionally, considering the role of sample size in meta-analysis effect merging, we calculated weighted averages of treatment frequency and modified Jadad scores using sample size as weights. Consequently, unlike previous acupuncture optimal protocol studies [18-22,43-44], sample size did not need to be included as a separate decision indicator in this study. Third, we conducted visual analysis by presenting the standardized decision matrix through heat maps, intuitively showing the advantages and disadvantages of each treatment protocol.

In the MCDM process, indicator weights were determined using the entropy weight method, an objective weighting approach that assigns weights based on the dispersion degree of different indicator values. Entropy represents the uncertainty in a system—the smaller the entropy value, the greater the indicator's dispersion and its influence (weight) on comprehensive evaluation. The entropy weight method maximally utilizes data characteristics, making evaluation results more credible, and compared with various subjective weighting models, effectively avoids interference from human factors, thereby enhancing the objectivity of comprehensive evaluation results [46-47]. During indicator selection, we endeavored to choose objective indicators while ensuring sufficient literature quantity and quality. However, due to differences in publication years and outcome indicator selection across migraine studies, we ultimately included three efficacy indicators: cure rate, efficiency rate, and VAS. The visual heat map in this study showed that cure rate and efficiency rate had small variations across protocols, and entropy weight calculations also indicated their weights were less than 10%. Therefore, the entropy weight method reduced the utilization

of these two indicators. While this somewhat diminished the decision-making capacity of MCDM, it also demonstrated another advantage of the TOPSIS method—helping us understand the sensitivity of different outcome indicators, which provides insights for future clinical research. The relatively distinct discrimination of VAS suggests that more attention should be paid to the value of VAS and other objective indicators in future multi-indicator evaluations of migraine clinical intervention protocols.

This study is the first to apply meta-analysis combined with the entropy weight-TOPSIS method in evidence-based acupuncture research to screen optimal migraine treatment protocols, using heat maps for visual analysis of each protocol's specific advantages. The completion of this study provides evidence support for migraine acupuncture protocol selection and offers a replicable methodology for future acupuncture optimal protocol screening research.

3.2 Limitations As research on constructing acupuncture optimized treatment plans is still in its early stages, this study has several limitations. First, the quality of original studies was uneven. Although modified Jadad scores were included as one aspect of MCDM, lower-quality RCTs somewhat reduced the evidence quality of the protocols. Studies with higher Jadad scores were concentrated in dissertations and recently published academic papers, while lower scores were mainly due to inadequate allocation concealment, blinding, and description of dropouts, suggesting that future clinical research should pay greater attention to methodological rigor. Second, the decision indicators selected in this study were relatively limited. Cure rate and efficiency rate showed small variations, leading the entropy weight method to reduce their utilization. Other objective indicators such as headache frequency were not reported in some studies and thus could not be included. Third, despite combining studies based on acupuncture methods, heterogeneity still existed within each constructed protocol due to differences in needle retention time and needling depth. It is important to note that acupuncture features pattern differentiation and treatment individualization—how to balance optimized protocols with specific operational details remains a methodological issue that needs further resolution in acupuncture clinical research. In the future, as various decision algorithms become more widely applied, the combination of MCDM methods with evidence-based evidence will provide more practical foundations for the development of traditional Chinese medicine guidelines and promotion.

References

[1] GBD Neurology Collaborators. Global, regional, and national burden of neurological disorders, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016[J]. Lancet Neurol, 2019, 18(5): 459-480. DOI: 10.1016/S1474-4422(18)30499-X.

[2] Headache classification committee of the international headache society (IHS) the international classification of headache disorders, 3rd edition[J]. Cephalalgia, 2018, 38(1): 1-211. DOI: 10.1177/0333102417738202.

[3] FERRARI M D, GOADSBY P J, BURSTEIN R, et al. Migraine[J]. Nat Rev Dis Primers, 2022, 8(1): 2. DOI: 10.1038/s41572-021-00328-4.

[4] EIGENBRODT A K, ASHINA H, KHAN S, et al. Diagnosis and management of migraine in ten steps[J]. Nat Rev Neurol, 2021, 17(8): 501-514. DOI: 10.1038/s41582-021-00509-5.

[5] AMERICAN HEADACHE SOCIETY. The American headache society position statement on integrating new migraine treatments into clinical practice[J]. Headache, 2019, 59(1): 1-18. DOI: 10.1111/head.13456.

[6] NAGUIT N, LAEEQ S, JAKKOJU R, et al. Is acupuncture safe and effective treatment for migraine? A systematic review of randomized controlled trials[J]. Cureus, 2022, 14(1): e20888. DOI: 10.7759/cureus.20888.

[7] FARAHMAND S, SHAFAZAND S, ALINIA E, et al. Pain management using acupuncture method in migraine headache patients; A single blinded randomized clinical trial[J]. Anesth Pain Med, 2018, 8(6): e81688. DOI: 10.5812/aapm.81688.

[8] XU S B, YU L L, LUO X, et al. Manual acupuncture versus sham acupuncture and usual care for prophylaxis of episodic migraine without aura: multicentre, randomised clinical trial[J]. BMJ, 2020, 368: m697. DOI: 10.1136/bmj.m697.

[9] ZHAO L, CHEN J, LI Y, et al. The long-term effect of acupuncture for migraine prophylaxis: a randomized clinical trial[J]. JAMA Intern Med, 2017, 177(4): 508-515. DOI: 10.1001/jamainternmed.2016.9378.

[10] GIOVANARDI C M, CINQUINI M, AGUGGIA M, et al. Acupuncture vs. pharmacological prophylaxis of migraine: a systematic review of randomized controlled trials[J]. Front Neurol, 2020, 11: 576272. DOI: 10.3389/fneur.2020.576272.

[11] LOU Hongyan. Network meta-analysis of acupuncture for migraine[D]. Urumqi: Xinjiang Medical University, 2020.

[12] WANG Wentong, WANG Enzhong, LI Sheng, et al. Analysis of acupoint selection patterns in simple acupuncture treatment of migraine based on data mining technology[J]. Chinese Journal of Imaging and Interventional Traditional and Western Medicine, 2021, 19(4): 307-310. DOI: 10.3969/j.issn.1672-0512.2021.04.001.

[13] WEN Ya, WANG Dan, FAN Gangqi. Acupoint selection for acupuncture treatment of acute migraine[J]. Chinese Acupuncture & Moxibustion, 2018, 38(11): 1183-1188. DOI: 10.13703/j.0255-2930.2018.11.013.

[14] MARDANI A, JUSOH A, MD NOR K, et al. Multiple criteria decision-making techniques and their applications - a review of the literature from 2000 to 2014[J]. Econ Res Ekon Istrazivanja, 2015, 28(1): 516-571. DOI: 10.1080/1331677x.2015.1075139.

[15] LIU Yongjun, MA Linchao, LIU Guoen. Application of multi-indicator decision analysis in health technology assessment[J]. China Journal of Pharmaceutical Economics, 2014, 9(6): 9-12.

[16] WANG Jian, MENG Qingyue, GIRSCHIK J, et al. Application of multi-indicator decision analysis methods in health technology assessment[J]. Chinese Journal of Social Medicine, 2009, 26(2): 67-69. DOI: 10.3969/j.issn.1673-5625.2009.02.002.

[17] HWANG C L, YOON K. Methods for multiple attribute decision making[M]//Multiple Attribute Decision Making. Berlin, Heidelberg: Springer Berlin Heidelberg, 1981: 58-191.

[18] WANG Liran, NING Wenhua, YANG Lihong, et al. Screening study on optimal protocol of acupuncture for post-stroke shoulder-hand syndrome[J]. Journal of Clinical Acupuncture and Moxibustion, 2022, 38(2): 46-52. DOI: 10.19917/j.cnki.1005-0779.022032.

[19] QIN Yinan, WANG Liran, XIE Yue, et al. Screening study on optimal protocol of acupuncture for vascular dementia in recent 10 years[J]. China Journal of Traditional Chinese Medicine and Pharmacy, 2020, 35(8): 3985-3989.

[20] ZHANG Jingjing, LI Bo, DU Yuanhao, et al. Screening study on optimal protocol of acupuncture for chronic fatigue syndrome[J]. Journal of Basic Chinese Medicine, 2020, 26(8): 1123-1126, 1217. DOI: 10.3969/j.issn.1006-3250.2020.08.027.

[21] LIU Jialin, DU Yuanhao, HU Yacai, et al. Study on optimal protocol of acupuncture for post-stroke depression based on analytic hierarchy process[J]. Liaoning Journal of Traditional Chinese Medicine, 2018, 45(3): 595-598. DOI: 10.13192/j.issn.1000-1719.2018.03.044.

[22] ZHANG Jingjing, DU Yuanhao, LI Jing, et al. Screening study on optimal protocol of acupuncture for lateral femoral cutaneous neuritis[J]. Chinese Acupuncture & Moxibustion, 2019, 39(3): 323-328. DOI: 10.13703/j.0255-2930.2019.03.026.

[23] ALEJANDRO R, JADAD, MD D, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary?[J]. Control Clin Trials, 1996, 17(1): 1-12. DOI: 10.1016/0197-2456(95)00134-4.

[24] LIU Qing, ZHAI Wei, TAN Yaqin, et al. Brief analysis of quality assessment tools for clinical research literature[J]. Chinese Acupuncture & Moxibustion, 2014, 34(9): 919-922. DOI: 10.13703/j.0255-2930.2014.09.019.

[25] ZHANG Ruiqiu, CHEN Yinghua. Clinical observation on acupuncture

treatment of migraine guided by "Biao-Ben and Gen-Jie" theory[J]. Journal of Guangzhou University of Traditional Chinese Medicine, 2021, 38(2): 306-310. DOI: 10.13359/j.cnki.gzxbtcm.2021.02.016.

[26] YU Ming, ZHOU Qianwen, XU Yuhao. Effects of acupuncture on plasma CGRP, β-EP and 5-HT in patients with chronic migraine[J]. Jiangsu Medical Journal, 2017, 43(10): 710-713. DOI: 10.19460/j.cnki.0253-3685.2017.10.011.

[27] YANG Xuguang. Clinical observation on the short-term and long-term efficacy of electroacupuncture at "Siguan" points in treating migraine without aura[D]. Chengdu: Chengdu University of Traditional Chinese Medicine, 2006.

[28] YANG Xiongqing. Clinical observation on acupuncture efficacy for migraine[J]. Journal of Zhejiang Chinese Medical University, 2013, 37(5): 617-619. DOI: 10.16466/j.issn1005-5509.2013.05.021.

[29] YANG Jia, SHEN Yan, WANG Shu. Comparative study on preventive clinical efficacy of acupuncture versus flunarizine hydrochloride in treating migraine[J]. Modernization of Traditional Chinese Medicine and Materia Medica-World Science and Technology, 2018, 20(5): 750-755. DOI: 10.11842/wst.2018.05.021.

[30] SU Huiyuan, LI Jing, DU Yuanhao. Efficacy observation of Tiaoshen Shugan acupuncture method in treating 35 cases of migraine[J]. Hunan Journal of Traditional Chinese Medicine, 2016, 32(8): 102-103. DOI: 10.16808/j.cnki.issn1003-7705.2016.08.046.

[31] SHU Wei, PENG Tianzhong, HUANG Xuedi, et al. Efficacy observation of intermittent Rougan Tiaoshen acupuncture method in preventive treatment of migraine[J]. Shanghai Journal of Acupuncture and Moxibustion, 2017, 36(6): 727-730. DOI: 10.13460/j.issn.1005-0957.2017.06.0727.

[32] LU Jinrong, YAO Suyuan. Efficacy observation of electroacupuncture in treating 48 cases of migraine[J]. Chinese Journal of Traditional Medical Science and Technology, 2014, 21(1): 92.

[33] LIU Yunxia. Clinical effect of acupuncture in treating migraine[J]. Inner Mongolia Journal of Traditional Chinese Medicine, 2020, 39(12): 111-112. DOI: 10.16040/j.cnki.cn15-1101.2020.12.062.

[34] LIU Bo, ZHOU Fengdan. Effect of acupuncture therapy in treating common migraine[J]. Contemporary Medicine Forum, 2021, 19(16): 148-150. DOI: 10.3969/j.issn.2095-7629.2021.16.067.

[35] JING Yunnan. Clinical efficacy observation of Shugan Ningshen acupuncture method in preventive treatment of migraine[D]. Harbin: Heilongjiang University of Chinese Medicine, 2021.

[36] GUO Wei, RAO Huajin. Efficacy observation of acupuncture in treating migraine[J]. Shanghai Journal of Acupuncture and Moxibustion, 2011, 30(5): 289-290. DOI: 10.3969/j.issn.1005-0957.2011.05.289.

[37] GUAN Shuting, YE Gaxi, ZHANG Yu, et al. Clinical efficacy evaluation of acupuncture at “Six Spirit Points” in treating migraine[J]. Lishizhen Medicine and Materia Medica Research, 2019, 30(7): 1664-1666. DOI: 10.3969/j.issn.1008-0805.2019.07.042.

[38] DAI Qing, JIANG Bin, YANG Liu, et al. Efficacy observation of Bone-Nearby needling method in treating 35 cases of migraine[J]. Zhejiang Journal of Traditional Chinese Medicine, 2017, 52(9): 687-688. DOI: 10.3969/j.issn.0411-8421.2017.09.041.

[39] CUI Jing. Clinical observation on acupuncture treatment of migraine without aura in Swiss Caucasians[D]. Chengdu: Chengdu University of Traditional Chinese Medicine, 2016.

[40] CHEN Shuokang. Clinical observation on Lai’s Tongyuan acupuncture method in treating migraine without aura with liver-yang hyperactivity pattern[D]. Guangzhou: Guangzhou University of Chinese Medicine, 2017.

[41] CHEN Hui, SHI Jingyang. Clinical observation on acupuncture along meridians in treating migraine[J]. Guangming Journal of Chinese Medicine, 2019, 34(10): 1564-1566. DOI: 10.3969/j.issn.1003-8914.2019.10.042.

[42] ZHOU Yi, ZHAO Xiaolong. Medical information analysis and decision making[M]. Beijing: Publishing House of Electronics Industry, 2014.

[43] YANG Fengwen, ZHANG Junhua, ZHANG Boli. Quality evaluation of network meta-analysis of traditional Chinese medicine[J]. China Journal of Traditional Chinese Medicine and Pharmacy, 2018, 33(10): 4599-4606.

[44] LIU Jialin, DU Yuanhao, LI Bo, et al. Study on optimal protocol of acupuncture for occipital neuralgia based on multi-indicator decision making method[J]. Liaoning Journal of Traditional Chinese Medicine, 2019, 46(9): 1799-1803. DOI: 10.13192/j.issn.1000-1719.2019.09.002.

[45] YAN Chao. Evaluation and selection of optimal acupuncture protocol for acne using multi-indicator decision making method[J]. Hunan Journal of Traditional Chinese Medicine, 2017, 33(11): 136-138. DOI: 10.16808/j.cnki.issn1003-7705.2017.11.068.

[46] DING X W, CHONG X, BAO Z F, et al. Fuzzy comprehensive assessment method based on the entropy weight method and its application in the water environmental safety evaluation of the heshangshan drinking water source area, Three Gorges Reservoir area, China[J]. Water, 2017, 9(5): 329. DOI: 10.3390/w9050329.

[47] TAHERIYOUN M, KARAMOUZ M, BAGHVAND A. Development of an entropy-based Fuzzy eutrophication index for reservoir water quality evaluation[J]. Iran J Environ Health Sci Eng, 2010, 7(1): 1-14.

Author Contributions: WANG Zhe conceptualized the research, designed the methodology, and drafted the manuscript; DONG Zhihao performed data cleaning and verification; ZHENG Hao and KONG Wencheng contributed to drafting and revising the manuscript; ZHANG Yukuan and ZHANG Qiuyue completed literature search, screening, and data extraction; HAN Jing was responsible for quality control and final approval of the manuscript.

Conflict of Interest: The authors declare no conflict of interest.

Received Date: 2022-10-17; **Revised Date:** 2023-06-02

Digital Publication Date: 2023-06-30

Edited by: WANG Shiyue

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

Source: ChinaXiv — Machine translation. Verify with original.