

The use of traditional Chinese medicine diagnostic methods in heart failure – an evidence map

Hong Chen¹, Si-yi Li¹, Shuang-qiu Wang¹, Shi-jia Wang¹, Xiao-wei Zhang^{1,2}, Xiao-yu Zhang^{3,✉}, Hong-cai Shang^{1,4,✉}

¹Key Laboratory of Chinese Internal Medicine of Ministry of Education and Beijing, Beijing University of Chinese Medicine, Beijing, 100700, China

²School of Integrated Chinese and Western Medicine, Hunan University of Chinese Medicine, Changsha, 410208, China

³Institute of Basic Research in Clinical Medicine, China Academy of Chinese Medical Sciences, Beijing, 100700, China

⁴Dongfang Hospital, Beijing University of Chinese Medicine, Beijing, 100078, China

Received: April 1, 2025; Revised: July 25, 2025; Accepted: July 31, 2025

ABSTRACT

Introduction Heart failure (HF) is a significant global health issue. There is an ongoing need for early detection and monitoring of its severity, which remains a critical and unmet requirement. Inspection diagnosis in traditional Chinese Medicine (TCM) is a method of assessing the condition of the internal *zang-fu* organs by observing the body's external manifestations, offering a promising approach to this issue. In this study, we aimed to systematically evaluate the existing research on the correlation between TCM diagnostic inspection and HF, using an evidence map to uncover potential research directions in this domain. **Methods** A comprehensive literature search was conducted across several databases, including the China National Knowledge Infrastructure (CNKI), Wanfang Database, Chinese Scientific Journal Database (VIP), PubMed, and Web of Science. The search screened clinical studies, systematic reviews, guidelines, and clinical pathways relevant to diagnostic inspection and HF. The collected data were analyzed using graphical and textual representations to delineate the distribution and characteristics of the evidence. **Results** Overall, 33 studies, comprising 14 cross-sectional, 8 cohort, and 11 case-control studies, were included in the analysis. The clinical research output showed consistent growth between 1992 and 2024, with 70% of the investigations enrolling ≤ 300 participants. The primary focus of these studies was chronic HF (10 studies, 30.3%). Regarding diagnostic approaches, 26.47% used visual assessment and 61.76% used device-based methods. Inspection diagnosis played several roles in HF management, predominantly facilitating disease risk prediction (15 studies, 45.45%) and disease severity evaluation (14 studies, 42.42%). **Conclusion** Observational evidence from TCM inspection diagnoses, especially regarding retinal/fundus and tongue manifestations, indicates that it may be of possible prognostic use. However, this needs to be confirmed through high-quality prospective studies, which should also validate the auxiliary role of inspection diagnoses in preventing and treating HF.

KEYWORDS

heart failure, inspection diagnosis, retinal, fundus, tongue, traditional Chinese medicine, evidence map

CITE THIS ARTICLE

Chen H, Li SY, Wang SQ, et al. The use of traditional Chinese medicine diagnostic methods in heart failure: an evidence map. Evidence-Based Chinese Medicine and Technology Assessment, 2025, 1: 9570010. <https://doi.org/10.26599/eCMTA.2025.9570010>

1. Introduction

Heart failure (HF) is a serious global public issue and represents the final stages of various cardiac ailments. According to epidemiological data, as of 2017, over 60 million individuals worldwide were affected by HF.¹ The prevalence of HF is influenced by modern lifestyles, which often include deleterious lifestyle choices and an aging population. Current estimates show that approximately 2% of people living in Europe (notably, 2.3% in France) and 2.4% of those living in the United States have HF, with projections suggesting an increase of 3% by 2030.² In China, a survey showed that the weighted prevalence of HF among Chinese residents aged ≥ 35 years was 1.3%, indicating approximately 13.7 million people having HF.³ Despite the significant advancements in modern pharmacological and non-pharmacological interventions that have undeniably enhanced patient survival and quality of life, recurrent hospitalization remains a major challenge for patients with HF.⁴ This high incidence of readmission inflicts considerable suffering on patients and imposes a substantial burden on healthcare systems. Reducing readmission rates and, more importantly, identifying and predicting the progression of HF at an early stage is important. Early diagnosis holds promise for improving patient prognosis and paving the way for personalized prevention strategies.^{5,6} However, the complexity of clinical manifestations presents sig-

nificant challenges to existing early identification methods.⁷

In this context, the diagnostic approach of traditional medicines, particularly traditional Chinese medicine (TCM), provides a unique and pragmatic pathway. With a history spanning thousands of years, TCM diagnoses patients through four methods: inspection, auscultation and olfaction, inquiry, and palpation. Foremost among these is inspection, a practice that resonates strongly with the modern medical emphasis on early disease warning. TCM believes that internal pathological changes are inevitably reflected in external signs. Inspection diagnosis is a non-invasive method that evaluates the condition of internal organs by examining their external manifestations. This process is divided into two components: systemic and regional observation. Systemic observation assesses four core indicators: spirit (*Shen*), skin color (*Se*), body build (*Xing*), and posture and movement (*Tai*). Regional observation, named for the specific area examined, involves techniques such as tongue diagnosis, which entails inspecting the tongue's body and coating for diagnostic information. This holistic approach to diagnosis is primarily manifested through an inspection diagnosis that examines external signs, including facial complexion and tongue images. Grounded in systematic observation, it holds potential for detecting and preventing HF early. Consequently, TCM offers a complementary strategy to contemporary medical

✉ Corresponding authors.

E-mail addresses: zbzhangxiaoyu@aliyun.com (XY. Zhang); shanghongcai@126.com (HC. Shang)

© 2025 Beijing University of Chinese Medicine. Production and hosting by Tsinghua University Press. This is an open access article under the CC-BY license (<http://creativecommons.org/licenses/by/4.0/>).

practices.

The contemporary universal classification of HF delineates this condition into four stages: HF risk (stage A), pre-HF (stage B), symptomatic HF (stage C), and advanced HF (stage D). This staging framework emphasizes the importance of early detection of individuals at risk (stage A) and those in the pre-HF phase (stage B) as vital strategies in managing HF. It also highlights how staging significantly impacts patient prognosis.⁸ Inspection diagnosis can promptly identify changes in a patient's condition while treating HF, enabling timely adjustments to the therapeutic regimen.⁹ Furthermore, this method helps distinguish between different stages of HF, enabling more targeted treatments and management strategies. This approach enhances treatment efficacy and significantly improves the quality of life of patients.¹⁰ For instance, weight gain in patients with HF frequently develops prior to clinical edema. Short-term weight increase, urine output reduction, and fluid imbalance collectively serve as early indicators of fluid retention, enabling prompt intervention.¹¹ Recent studies indicate that TCM diagnostic inspection accurately identifies early-stage HF biomarkers, showing potential for early identification, therapeutic intervention, and prognostic assessment.¹²

Despite preliminary studies showing the association between inspection diagnosis and HF, as well as its potential clinical use in managing HF, the current evidence remains limited. Evidence distribution, research quality, and specific implementation still lack systematic review and integration. To address these limitations and further elucidate the scientific foundations and clinical applicability of inspection diagnosis in HF, we conducted an evidence map (EM) approach study to comprehensively assess its diagnostic and therapeutic value.¹³ With this approach, we aimed to provide a comprehensive overview of the current research advances, identify knowledge gaps, and provide valuable insights to guide future mechanistic and clinical investigations.

2. Methods

2.1. Search strategy

A comprehensive search was conducted across multiple databases, including the China National Knowledge Infrastructure (CNKI), Wanfang Database, Chinese Scientific Journal Database (VIP), PubMed, and Web of Science, to identify Chinese and English literature on diagnosing and treating HF using diagnostic inspection in TCM. The search period spanned between the inception of these databases and January 2025. The search strategy used a combination of subject terms and words (Appendix 1). Key Chinese search terms included “heart failure,” “cardiac insufficiency,” “inspection diagnosis,” and specific diagnostic methods including “tongue diagnosis,” “facial diagnosis,” “hand diagnosis,” “visual diagnosis,” “eye diagnosis,” and “ear diagnosis.” Corresponding English terms including “cardiac failure,” “heart failure,” “myocardial failure,” “inspect,” “manifest,” “tongue,” “face,” and “eye” were used.

2.2. Inclusion and exclusion criteria

Studies were included if they met the following criteria: observational studies (cohort, case-control, cross-sectional studies, and case series), evidence syntheses (systematic reviews and meta-analyses), and clinical guidance documents (guidelines, expert consensus, and clinical pathways). Eligibility required meeting the diagnostic criteria of HF, without restrictions on age, sex, geographic region, or ethnicity. Exclusions encompassed animal studies, clinical trial protocols, conference abstracts, duplicate publications, and articles with inaccessible full texts.

2.3. Literature screening and data extraction

Literature screening was conducted using NoteExpress (version 3.8, Aegean Software, Beijing, China). After de-duplication, titles and abstracts were reviewed using the inclusion and exclusion criteria for initial screening. Subsequently, the selected studies were downloaded and the full texts reviewed for final screening. The final included studies were imported into Microsoft Excel 2019 (Microsoft, Redmond, WA) to process data extraction form and relevant data. Two trained researchers (HC and SQW) indepen-

dently conducted concurrent literature screening, including title and abstract screening and full-text review. Disagreements were resolved through discussion or arbitration by a third researcher (XYZ) to achieve final consensus when required.

Data extraction included the first author, year of publication, type of study, sample size, diagnostic inspection techniques, main content of diagnostic inspection, and the role played by diagnostic inspection. A single reviewer (HC) abstracted all data extractions, which a second reviewer (SQW) overread. Disagreements were resolved by consensus or by obtaining a third reviewer's opinion (XYZ) when consensus could not be reached.

2.4. Methodological quality assessment of literature

In this study, we conducted methodological quality assessment of observational studies. The Newcastle-Ottawa Scale (NOS)¹⁴ was used to evaluate the cohort and case-control studies, including eight entries on the selection of study subjects, intergroup comparability, exposure factors, and outcome measures. Each entry had a corresponding scale, with a total score of 9. Higher scores indicated higher study quality; a study with a score of 7–9 was considered of high quality, with scores of 4–6 reflecting moderate quality and scores of <4 low quality.

Cross-sectional studies were evaluated using the Agency for Healthcare Research and Quality (AHRQ) scale,^{15,16} comprising 11 entries, characterized by “Yes,” “No,” and “Not sure” (“1” point for “Yes,” “0” point for “Not sure” or “No”). Higher scores indicated higher quality studies, with scores of 0–3 reflecting low quality, 4–7 moderate quality, and 8–11 high quality.

2.5. Data analysis

Data were analyzed and presented using figures and charts. Origin 2025 (OriginLab, Northampton, MA) and Microsoft Excel 2019 (Microsoft) were used to generate charts that effectively showed the distribution of evidence. Bar charts showed temporal trends in publication frequency over time. Tables were created to show detailed information regarding literature type, sample sizes, inspection sites, and inspection testing methods. Bar charts were used to facilitate comparative analysis of the frequencies of the different categories. Additionally, the evidence distribution was visually represented using bubble charts to provide a comprehensive and intuitive overview of the data. This multifaceted approach to the presentation of data ensures clarity, precision, and accessibility for readers.

3. Results

Overall, 880 records were retrieved from the database search, and 222 duplicates were removed, leaving 658 studies for initial screening. After initial screening and reading of the full text, 33^{17–49} observational studies were included in this analysis. The literature screening process is illustrated in Figure 1.

3.1. Year of publication

Publications investigating the use of TCM inspection for diagnosing HF first appeared in 1992, with the most recent study published in 2024. An analysis of 33 clinical studies published between January 1992 and January 2025 showed a progressive rise in scholarly output. Specifically, between 1992 and 2017, the publication count remained modest and stable (1 study). A notable increase in publication activity was observed in 2018. The annual publication rate has remained high, following a resurgence in 2022 despite a slight decline in the last two years, with four articles published. This trend shows the growing interest and attention toward clinical research exploring the correlation between TCM inspection diagnosis and HF, paralleling the advancement of modern Chinese medicine. The publication trends are shown in Figure 2.

3.2. Characteristics of studies

3.2.1. Study type and sample size

The 33 clinical studies we included were observational. Notably, cross-sec-

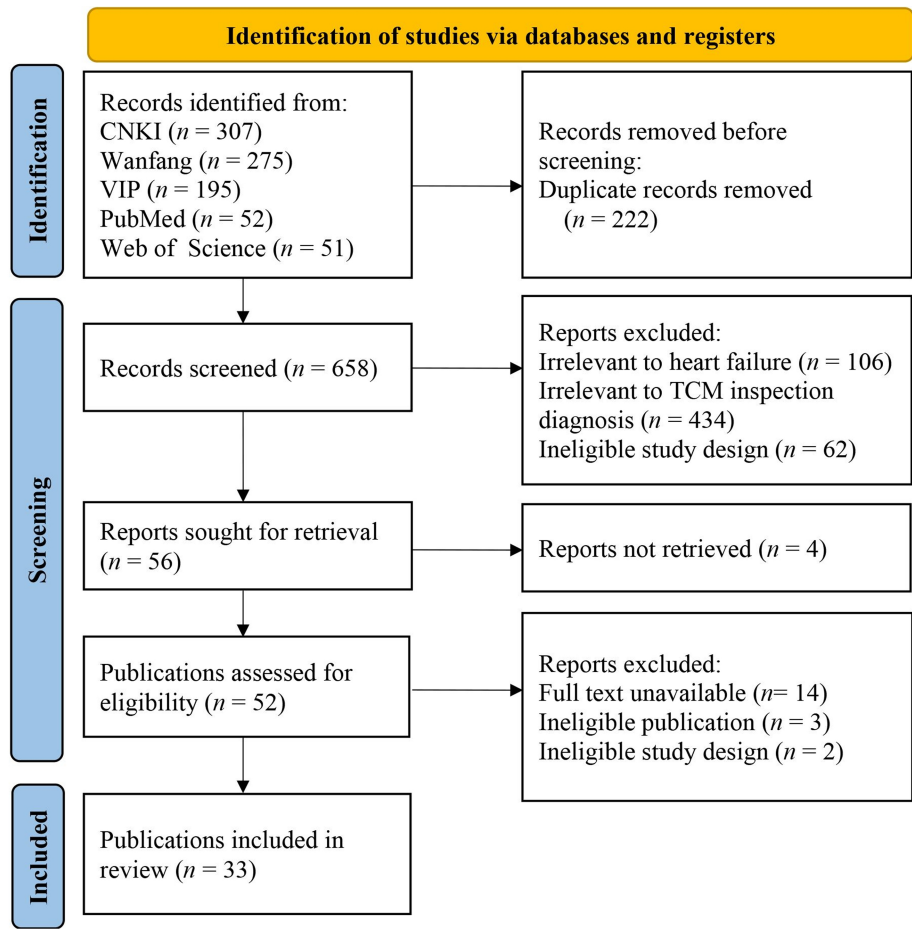


Figure 1 Article screening process

Notes: CNKI: China National Knowledge Infrastructure; TCM: traditional Chinese medicine; VIP: Chinese Scientific Journal Database.

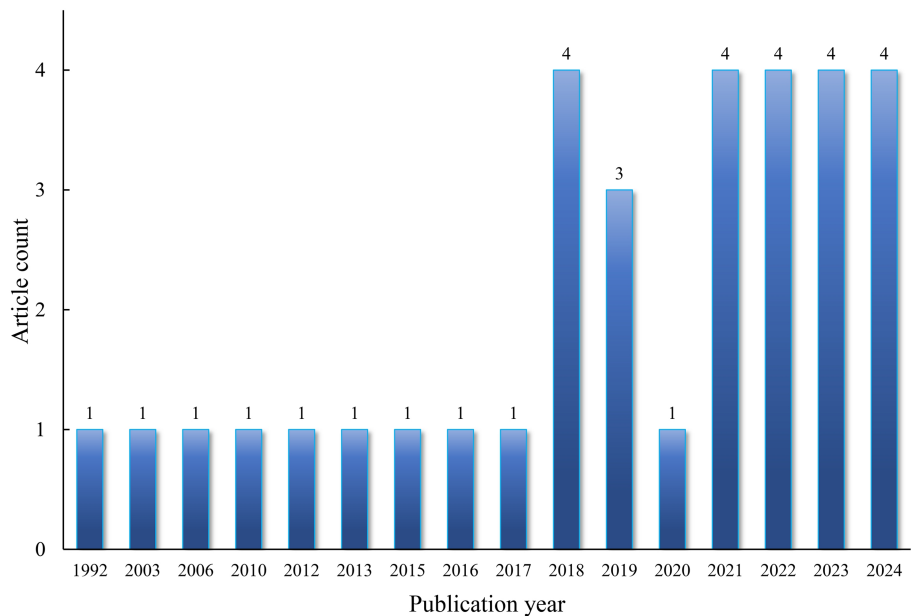


Figure 2 Year of publication process

tional studies constituted the largest proportion (14 studies, 42.42%), followed by case-control studies (11 studies, 33.33%), while cohort studies were the least represented, comprising eight studies (24.24%) (Table 1). A review

of the sample sizes showed that most of the studies had sample sizes <300 cases (70%), with relatively few clinical studies having larger sample sizes of >450 cases (20%). For cross-sectional studies, the participant count ranged from a

Table 1 Characteristics of studies

Category	Characteristics	Cross-sectional study (<i>n</i> = 14)	Case-control study (<i>n</i> = 11)	Cohort study (<i>n</i> = 8)	Total (<i>n</i> = 33)
Sample size	<i>n</i> ≤ 150	6	11	1	18
	150 < <i>n</i> ≤ 300	3	0	2	5
	300 < <i>n</i> ≤ 450	2	0	1	3
	450 < <i>n</i> ≤ 1000	1	0	0	1
	<i>n</i> > 1000	2	0	4	6
Reported heart failure	Acute decompensated heart failure	0	1	0	1
	Congestive heart failure	1	2	1	4
	Heart failure with reduced ejection fraction	0	2	0	2
	Heart failure with preserved ejection fraction	1	2	0	3
	Chronic heart failure	7	3	0	10
	Heart failure	4	1	5	10
	Acute heart failure	1	1	1	3
	Ischemic heart failure	0	0	1	1
	Retinal/fundus camera	3	5	4	12
Diagnostic testing methods	Optical coherence tomography	0	4	0	4
	Naked eye observation	6	0	2	8
	Tongue imaging	2	0	0	2
	Camera	2	0	1	3
	Other	1	2	1	4
Examination area	Ear	0	1	0	1
	Skin	1	0	1	2
	Tongue	8	0	1	9
	Sublingual veins	4	0	0	4
	Tongue tip	1	0	0	1
	Tongue fluid	0	1	0	1
	Sublingual microcirculation	0	1	0	1
	Retinal/fundus	1	8	6	15
	Holistic inspection	2	0	0	2

minimum of 31 cases to a maximum of 1680 cases. In cohort studies, the sample size varied between 55 cases and a substantial 319 501 cases, with the largest proportion of studies exceeding 1000 cases. Case-control studies had a participant range of 28 to 148 cases, indicating a preponderance of studies with small sample sizes, highlighting the notable absence of large-scale investigations.

3.2.2. Reported heart failure

HF reported in the literature include acute decompensated HF, congestive HF, HF with reduced ejection fraction, HF with preserved ejection fraction, chronic HF, acute HF, and ischemic HF. Chronic HF and unspecified HF were most frequently reported (10 studies each). However, acute decompensated HF and ischemic HF have only been mentioned once in the literature.

3.2.3. Distribution of testing methods and sites

Traditional inspection diagnosis primarily depends on visual assessment by professionals, but with the development of modern technology, modern TCM diagnostic inspection testing methods are gradually enriched. In addition to visual observation, inspection information can also be obtained using inspection instruments (tongue image instrument), optical coherence tomography, retinal/fundus camera, and other modern instruments. We discovered that studies using visual observation accounted for 26.47% of the total number of studies, and those using modern instruments accounted for 61.76%. Modern instruments are objective and sophisticated, and their use is becoming a trend.

The total number of reported inspection sites included the ear, skin, tongue, sublingual veins, tongue tip, tongue fluid, sublingual microcirculation, retinal/fundus, and holistic inspection. Most studies examined the relationship between tongue-related features (including the tongue, sublingual veins, sublingual microcirculation, tongue tip, and tongue fluid) and HF, totaling 17 studies. This was followed by studies exploring the retinal/fundus and HF, which were included in 15 studies. This indicates a heightened focus on the tongue and retinal/fundus.

The specific observation of tongue characteristics is primarily divided into two aspects: tongue body and tongue coating (Figure 3). The tongue body is evaluated for its spirit, color, shape, and motility, while the tongue coating is assessed for color and texture. We found that among tongue body characteristics, red was the most frequently reported (7 studies), followed by pale red (5 studies) and dark purple (5 studies). Regarding tongue coating abnormalities, peeled/mirror tongue emerged as the most prevalent manifestation (13 studies), with thick (10 studies) and greasy (7 studies) coatings being the subsequent most common findings.

3.3. Role of inspection diagnosis in heart failure

Here, we categorized the role of inspection diagnosis in HF into seven distinct domains: TCM pattern differentiation, TCM constitution identification, disease diagnosis, disease severity evaluation, disease risk prediction, disease prognosis and risk prediction, and others. These categories are based on the correlation between the inspection diagnosis and HF, as reported in the literature. An evidence map showing the role of inspection diagnosis is shown in Figure 4. The bubble map revealed that most inspection diagnosis sites pri-

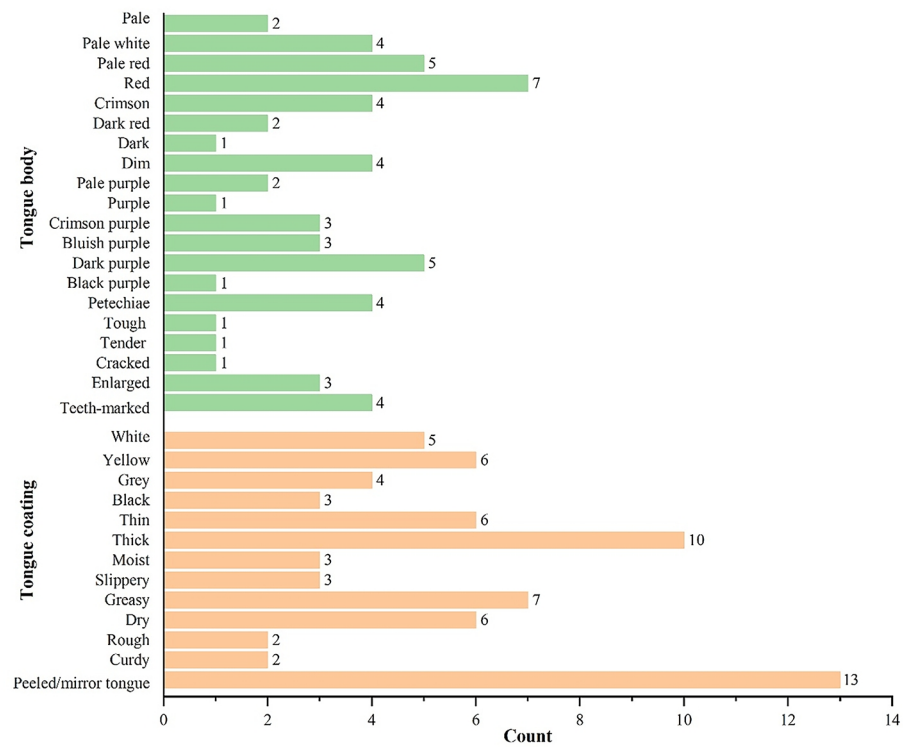


Figure 3 Distribution of tongue body and coating reports

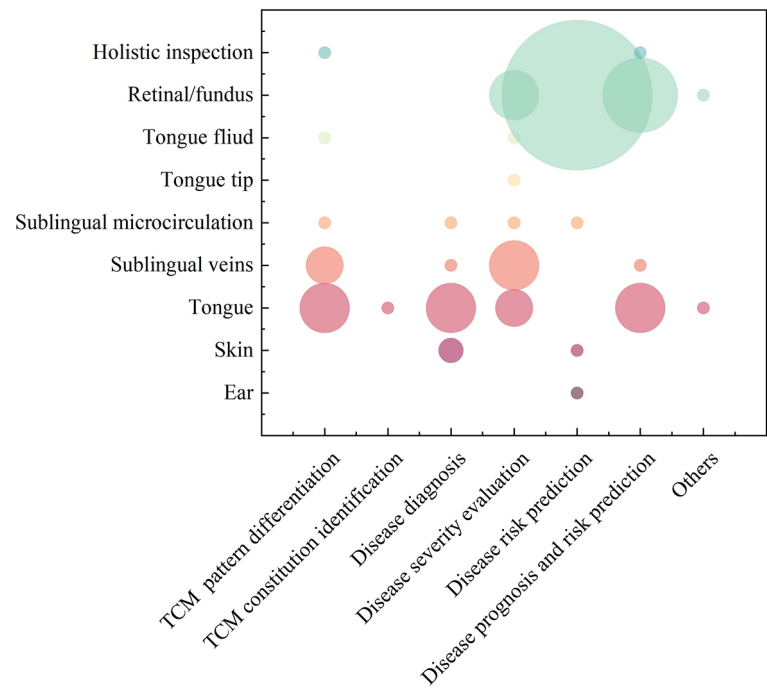


Figure 4 Function of inspection

Notes: The size of the bubble represents the number of articles.

marily contributed to TCM pattern differentiation and disease severity evaluation. Subsequent roles include disease diagnosis, disease prognosis and risk prediction, and disease risk prediction. Notably, TCM constitution identification received limited scholarly attention, with only one study addressing this aspect.

Overall, the literature predominantly focused on disease risk prediction (15 studies, 45.45%) and disease severity evaluation (14 studies, 42.42%),

reflecting these areas as primary research priorities.

3.4. Methodological quality evaluation

The methodological quality of the 33 observational studies was assessed using the AHRQ and NOS evaluation tools. The average AHRQ score of cross-sectional studies was 5.2, with scores ranging from 1 to 8. Meanwhile the

mean NOS score was 5.4 for case-control studies (with scores predominantly ranging between 5 and 6) and 6.6 for cohort studies (with scores distributed from 4 to 8). Moderate-quality studies were predominant, followed by a small number of low-quality studies (2 studies) and some high-quality studies (7

studies), as shown in Tables 2-4.

Notably, nearly all cross-sectional studies did not explain patient exclusion (11/14), failed to detail methodologies for handling missing data (13/14), and did not summarize patient response rates or the completeness of data

Table 2 AHRQ score of cross-sectional studies ($n = 14$)

Study ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Total score
Cui XJ, 2024 ¹⁷	1	1	1	1	0	0	0	0	0	0	0	4
Du JS, 1992 ¹⁸	0	0	0	1	1	1	0	1	0	0	0	4
Gopinath B, 2019 ¹⁹	1	0	1	1	1	1	1	0	0	1	0	7
Li DY, 2012 ²⁰	0	0	1	1	0	1	0	0	0	0	0	3
Phan K, 2015 ²¹	1	0	1	1	1	1	1	1	0	0	0	7
Rui XT, 2003 ²²	0	0	0	1	0	0	0	0	0	0	0	1
Tian MX, 2010 ²³	1	0	1	1	1	1	0	0	0	0	0	5
Wang RH, 2018 ²⁴	1	1	1	1	1	0	0	0	0	0	0	5
Wang XL, 2018 ²⁵	1	1	1	1	1	1	0	1	0	0	0	7
Wei JW, 2018 ²⁶	1	1	1	1	1	0	1	0	1	1	0	8
Xu XG, 2012 ²⁷	1	1	1	1	1	1	0	1	0	0	0	7
Xu XG, 2017 ²⁸	1	1	1	1	0	0	0	0	0	0	0	4
Zhang L, 2023 ²⁹	1	1	1	1	1	1	0	0	0	0	0	6
Zhao MY, 2021 ³⁰	1	1	1	1	1	0	0	0	0	0	0	5

Notes: AHRQ: Agency for Healthcare Research and Quality. Q1: Define the source of information (survey, record review); Q2: List inclusion and exclusion criteria for exposed and unexposed subjects (cases and controls) or refer to previous publications; Q3: Indicate time period used for identifying patients; Q4: Indicate whether or not subjects were consecutive if not population-based; Q5: Indicate if evaluators of subjective components of study were masked to other aspects of the status of the participants; Q6: Describe any assessments undertaken for quality assurance purposes (e.g., test/retest of primary outcome measurements); Q7: Explain any patient exclusions from analysis; Q8: Describe how confounding was assessed and/or controlled. Q9: If applicable, explain how missing data were handled in the analysis; Q10: Summarize patient response rates and completeness of data collection; Q11: Clarify what follow-up, if any, was expected and the percentage of patients for which incomplete data or follow-up was obtained.

Table 3 NOS score of case-control studies ($n = 11$)

Study ID	Selection	Comparability	Exposure	Total score
Liu XM, 2021 ³¹	2	1	2	5
Zhang L, 2024 ³²	2	2	1	5
Huang YH, 2020 ³³	2	2	2	6
Abdin A, 2024 ³⁴	2	1	2	5
Jung S, 2021 ³⁵	3	1	2	6
Khalilipour E, 2023 ³⁶	2	2	2	6
Sadowski J, 2022 ³⁷	2	1	2	5
Naegel MP, 2018 ³⁸	2	1	2	5
Weerts J, 2024 ³⁹	2	2	2	6
Topaloglu C, 2023 ⁴⁰	2	1	2	5
Kanar HS, 2021 ⁴¹	2	1	2	5

Notes: NOS: Newcastle-Ottawa Scale.

Table 4 NOS score of cohort studies ($n = 8$)

Study ID	Selection	Comparability	Outcome	Total score
Barthelmes J, 2019 ⁴²	2	1	1	4
Chandra A, 2019 ⁴³	4	2	2	8
Guo S, 2022 ⁴⁴	2	1	1	4
Kaya O, 2022 ⁴⁵	4	2	1	7
Matsuoka S, 2022 ⁴⁶	4	0	3	7
Rim TH, 2016 ⁴⁷	4	2	2	8
Wong TY, 2006 ⁴⁸	4	2	1	7
Chen YH, 2023 ⁴⁹	4	2	2	8

Notes: NOS: Newcastle-Ottawa Scale.

collection (12/14). Furthermore, none of these studies were scheduled for follow-up (14/14), leading to most cross-sectional studies being classified of moderate quality, with two studies being considered of low quality owing to significant methodological shortcomings.

Cohort studies showed a higher proportion of high-quality studies, while case-control studies were predominantly of moderate quality. However, issues persisted, including the underrepresentation of study subjects in most case-control and cohort studies, where the selected subjects partially represented the overall population (12/19). Additionally, almost half of the studies did not adequately address or adjust for confounders (8/19). Almost all cohort studies had insufficient follow-up, and when reported, the quality of follow-up was frequently inadequate or insufficiently described. This comprehensive evaluation indicates the need for improved methodological rigor in observational studies to enhance the reliability and validity of findings.

4. Discussion

This evidence map approach study synthesized the available information in the domains of diagnostic inspection and HF research. As a noninvasive diagnostic method, inspection diagnosis offers the dual benefits of convenience and safety. It enables the comprehensive collection of various patient signs, including spirit (*Shen*), skin color (*Se*), body build (*Xing*), and posture and movement (*Tai*), providing a holistic reflection of the body's condition. The findings from this evidence map approach study indicate that inspection diagnoses, especially those of the retinal/fundus and tongue, have significant potential for predicting disease risk and severity. Moreover, Wang et al.³⁰ evaluated the therapeutic effects of a proprietary Chinese herbal granule formulation in treating congestive HF by observing tongue alterations before and after treatment. This finding further suggests that inspection diagnosis can serve as a viable method for assessing treatment efficacy.

This is particularly relevant in the context of HF, a condition that varies considerably globally owing to variations in ethnicity, cultural and socioeconomic factors, and diverse healthcare systems. Regional differences in the use of guideline-directed pharmacotherapy and device therapy further underscore the need for targeted, region-specific prevention strategies.⁵¹ The convenience and safety of inspection diagnosis make it a promising tool that can be adapted to meet the needs of different regions, especially economically disadvantaged regions. Integrating inspection diagnosis into local preventive and therapeutic strategies could reduce the burden of HF in these regions.⁵²

The important roles of retinal/fundus and tongue inspection can be associated with the intricate relationship between systemic circulation and local microcirculation. Studies have reported a close association between alterations in the structure and function of the retinal vasculature and cardiovascular diseases, such as hypertension and coronary heart disease.^{53–55} Moreover, narrower diameters of retinal arteriovenous vessels are associated with an increased risk of long-term mortality and ischemic stroke.⁵⁶ Our research revealed an increased prevalence of peeled or mirror tongue in HF patients. Further study suggested that mirror tongue serves as a significant predictor of acute HF and an independent risk factor for major adverse cardiovascular events within 1 year.⁴⁹ These tongue images may reflect underlying microvascular dysfunction, as research has showed that perturbed microvascular blood flow in the sublingual microcirculation is frequently observed in patients with severe HF.⁵⁷ For those experiencing cardiogenic shock, there is an independent correlation between sublingual microcirculation and poor outcomes.⁵⁸ These findings indicate that local microcirculatory changes can be barometers of the overall health of the systemic circulatory system. Pathological changes in the cardiovascular system reflect corresponding alterations in the microcirculatory system, providing insight into the various stages of HF and serving dual roles in predicting the disease and assessing its severity. The retinal and sublingual microcirculations, which are more accessible and easier to visualize than other microcirculatory systems, offer a crucial perspective on the health of systemic vascular circulation.

The integration of modern technology into inspection diagnosis has significantly enhanced the accuracy and objectivity of diagnostic assessments.

Modern instruments, such as retinal/fundus cameras and tongue imaging devices, have transformed the diagnostic process through objectification, standardization, informatization, and intelligent technology. These advances have effectively reduced the subjectivity and limitations associated with traditional inspection diagnoses, leading to greater reliability and reproducibility. The development of specialized equipment has broadened the use of inspection diagnosis, simplifying the process for healthcare professionals and enabling patients or family members without a medical background to utilize inspection instruments for health monitoring. This innovation could empower patients at low-to-moderate risk to manage their condition at home, optimizing the allocation of medical resources. Furthermore, when diagnostic instruments are linked to modern telemedicine platforms, they can facilitate the long-term management of patients with chronic diseases. This enables healthcare providers to monitor real-time diagnosis of changes in patient color and tongue.⁵⁹ Anticipating the future, the pervasive dissemination and relentless advancement of modern technological devices are on the brink of catalyzing a paradigm shift in diagnosing and treating HF, steering it toward unprecedented levels of precision and intelligence. This impending evolution promises to redefine clinical paradigms and equip healthcare professionals with more sophisticated and effective tools for managing HF, thereby potentially transforming patient outcomes.

Through this study, we have uncovered several limitations in this field. The field remains largely exploratory, with no established standards or consensus guidelines. Substantial methodological heterogeneity exists across studies regarding design (cross-sectional, cohort, and case-control), sample size (ranging from 31 to 319 501 participants), and diagnostic methods (visual assessment versus device-based approaches). Different study designs can reveal the relationship between inspection diagnosis and HF from various dimensions. For example, cross-sectional studies reflect the association between inspection characteristics and HF at specific time points, while cohort studies can evaluate the predictive value of inspection indicators for prognosis. However, these differences may also lead to incomparability between pieces of evidence. Variations in study design can increase heterogeneity among studies, reducing the credibility and applicability of the evidence.⁶⁰ Furthermore, this study has inadequate sample representation and a significant lack of validation studies. Most importantly, our quality assessment showed that most of the included studies had moderate or low methodological quality using the established evaluation criteria. These low-quality studies carry inherent risks of increased bias, reduced result consistency, and limited clinical relevance.⁶¹

5. Conclusion

The results of this evidence map study show that TCM inspection diagnosis, particularly tongue and retinal/fundus diagnoses, may have potential in diagnosing and managing HF, as well as in disease risk prediction and disease severity evaluation. However, current evidence remains insufficient to establish a definitive link. To advance this field, future research should focus on establishing standardized TCM inspection diagnostic criteria. Researchers should implement more rigorous study designs with preregistered protocols and conduct large-scale longitudinal cohort studies. These studies would help elucidate the causal relationships between TCM inspection markers (tongue and retinal/fundus changes) and the progression of HF, while identifying the most promising directions for future investigation. These improvements could significantly enhance the quality and clinical applicability of research in this important area of integrative medicine.

Funding

This work was supported by the National Key R&D Program of China (grant no.: 2022YFC3502300), National Natural Science Foundation of China (grant no.: 82374627), and Fundamental Research Funds for the Central Public Welfare Research Institutes (grant no.: Z0876).

Author Contribution Statement

Hong Chen: Data curation, formal analysis, visualization, investigation, writing – original draft, and writing – review & editing. **Si-yi Li:** Investigation, writing – original draft, validation, and writing – review & editing. **Shuang-qiu Wang:** Data curation, visualization, validation, and writing – review & editing. **Shi-jia Wang:** Validation, investigation, and writing – review & editing. **Xiao-wei Zhang:** Writing – review & editing and visualization. **Xiao-yu Zhang:** Conceptualization, methodology, supervision, project administration, and writing – review & editing. **Hong-cai Shang:** Conceptualization, supervision, methodology, funding acquisition, and writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Electronic Supplementary Materials

The online version contains supplementary material available at <https://doi.org/10.26599/eCMTA.2025.9570010>.

References

- GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392(10159):1789–1858.
- Savarese G, Becher PM, Lund LH, Seferovic P, Rosano GMC, Coats AJS. Global burden of heart failure: a comprehensive and updated review of epidemiology. *Cardiovasc Res*. 2023;118(17):3272–3287.
- Hao G, Wang X, Chen Z, et al. Prevalence of heart failure and left ventricular dysfunction in China: the China Hypertension Survey, 2012–2015. *Eur J Heart Fail*. 2019;21(11):1329–1337.
- Lawson CA, Zaccardi F, Squire I, et al. 20-year trends in cause-specific heart failure outcomes by sex, socioeconomic status, and place of diagnosis: a population-based study. *Lancet Public Health*. 2019;4(8):e406–e420.
- McCoubrey A, Campbell RT. What is the future of diagnostics in heart failure? *Br J Hosp Med (Lond)*. 2025;86(2):1–6.
- Bozkurt B. Pre-heart failure: an important opportunity to prevent a deadly disease. *JACC Heart Fail*. 2023;11(8 Pt 1):1027–1031.
- Severino P, D'Amato A, Prosperi S, et al. Do the current guidelines for heart failure diagnosis and treatment fit with clinical complexity? *J Clin Med*. 2022;11(3):857.
- Bozkurt B, Coats AJS, Tsutsui H, et al. Universal definition and classification of heart failure: a report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure: Endorsed by the Canadian Heart Failure Society, Heart Failure Association of India, Cardiac Society of Australia and New Zealand, and Chinese Heart Failure Association. *Eur J Heart Fail*. 2021;23(3):352–380.
- Liu G Y, Zhang D, Ma X. Clinical research progress of traditional Chinese medicine in the intervention of chronic heart failure. *Chin J Heart Fail Cardiomyopathy*. 2021;5(4):270–274.
- The Standardization Project Group for “Clinical Application Guidelines for Dominant Diseases Treated with Chinese Patent Medicines”. Clinical application guidelines of Chinese patent medicines for heart failure (2021). *Chin J Integr Tradit West Med*. 2022;42(3):261–275.
- Chinese Medical Association, Chinese Medical Journals Publishing House, Chinese Society of General Practice, Editorial Board of Chinese Journal of General Practitioners of Chinese Medical Association, Expert Group of Guidelines for Primary Care of Cardiovascular Disease. Guideline for primary care of chronic heart failure (2019). *Chin J Gen Pract*. 2019;18(10):936–947.
- Sun J. Construction of a multivariate observation system for cardiovascular diseases. *Tradit Chin Med Res*. 2014;27(5):6–9.
- Zhang X, Qiu R, Li C, Shang H. Clinical research priority setting for traditional Chinese medicine. *Chin J Evid Based Med*. 2019;19(3):373–376.
- Wells GA, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomized studies in meta-analyses. The Ottawa Hospital Research Institute Web site. http://www.ohri.ca/programs/clinical_epidemiology/oxford.htm. Updated June 15, 2012. Accessed January 1, 2025.
- Zeng XT, Liu H, Chen X, et al. Series of meta-analysis part four: quality assessment tools for observational studies. *Chin J Evid Based Cardiovasc Med*. 2012;4(4):297–299.
- Rostom A, Dubé C, Cranney A, et al. *Celiac Disease*. Evidence Report/Technology Assessment No. 104. (Prepared by the University of Ottawa Evidence-based Practice Center, under Contract No. 290-02-0021.) AHRQ Publication No. 04-E029-2. Rockville, MD: Agency for Healthcare Research and Quality; 2004.
- Cui X, Yang B, Zhao A. Correlation between fundus retinopathy, silencing information regulator 4 with ventricular remodeling and cardiac function in patients with chronic heart failure. *China Med Herald*. 2024;21(17):9–12.
- Du JS, Yang C, Zhao M, Du JB. Observation on tongue coating in patients with chronic congestive heart failure. *Tradit Chin Med Res*. 1992;5(3):37–38.
- Gopinath B, Wang SB, Liew G, et al. Retinal vascular geometry and the prevalence of atrial fibrillation and heart failure in a clinic-based sample. *Heart Lung Circ*. 2019;28(11):1631–1637.
- Li DY. Correlation between lingual ecchymosis density and sublingual vein diameter with cardiac function classification in patients with chronic heart failure. *China Health Ind*. 2012;9(35):136.
- Phan K, Mitchell P, Liew G, et al. Association between retinal arteriolar and venule calibre with prevalent heart failure: a cross-sectional study. *Plos One*. 2015;10(12):e0144850.
- Rui XT. Skin changes in patients with chronic heart failure. *J Pract Diagn Ther*. 2003;17(6):494.
- Tian XM, Liu QQ, Kou LJ, Liang JP. Exploration of the evolutionary regularity of tongue manifestations in patients with acute heart failure. *J Emerg Tradit Chin Med*. 2010;19(9):1525–1526.
- Wang R, Li Y, Sun L, Wang B. Relationship between sublingual collaterals changes and blood components content in patients with chronic heart failure. *Chin J Integr Med Cardio Cerebrovasc Dis*. 2018;16(7):833–840.
- Wang X, Xiao Y, Ren C, et al. Correlation analysis between distribution features of tongue manifestations and some risk factors of the heart failure in dialysis patients. *China Med Herald*. 2018;15(10):110–113.
- Wei J, Huang X, Zhao H, et al. Correlation between four diagnosis methods of traditional Chinese medicine and quality of life of patients with chronic heart failure. *World Chin Med*. 2018;13(3):746–750.
- Xu XG, Zhang L, Xu BL, et al. Correlation between distribution features of syndrome types and tongue manifestations and cardiac functional grading in patients with chronic heart failure. *J Beijing Univ Tradit Chin Med*. 2012;35(5):312–316.
- Xu SQ. Observation on tongue images and exploration of mechanism in 60 patients with heart failure with normal ejection fraction. *Asia Pac Tradit Med*. 2017;13(8):112–114.
- Zhang L, Li X, He J. Clinical study on correlation between characteristics of tongue manifestation and NYHA cardiac function classification in patients with chronic heart failure. *New Chin Med*. 2023;55(16):75–80.
- Zhao M, Liu P, Yuan L, et al. Association and cluster analysis of syndrome, symptom, tongue, pulse, and moss in 215 patients with heart failure. *Chin J Integr Med Cardio Cerebrovasc Dis*. 2021;19(9):1464–1468.
- Liu X, Huang X, Zhang L, Deng B. Correlation between physical characteristic appearance of auricular point surface and chronic heart failure. *Acta Chin Med*. 2021;36(2):410–413.
- Zhang L, Li X, He J. Expression and significance of NFAT3 in tongue coating fluid of congestive heart failure with qi deficiency and blood stasis syndrome. *Liaoning J Tradit Chin Med*. 2024;51(6):10–13.
- Huang Y, Zeng W, Gan Q, et al. Analysis of diagnostic value of hemodynamics and sublingual microcirculation in patients with sepsis complicated with acute heart failure. *Chin J Front Med Sci Electron Ed*. 2020;12(9):56–60.
- Abdin A, Abdin AD, Merone G, et al. Cardio-ocular syndrome: retinal microvascular changes in acutely decompensated heart failure. *Eur J Heart Fail*. 2024;26(11):2421–2430.
- Jung S, Kolwelter J, Bosch A, et al. Hypertrophic remodelling of retinal arterioles in patients with congestive heart failure. *ESC Heart Fail*. 2021;8(3):1892–1900.
- Khalilpur E, Mahdizad Z, Molazadeh N, et al. Microvascular and structural analysis of the retina and choroid in heart failure patients with reduced ejection fraction. *Sci Rep*. 2023;13(1):5467.
- Sadowski J, Targonski R, Cyganski P, et al. Remodeling of retinal arterioles and carotid arteries in heart failure development—a preliminary study. *J Clin Med*. 2022;11(13):3721.
- Nägele MP, Barthelmes J, Ludovici V, et al. Retinal microvascular dysfunction in heart failure. *Eur Heart J*. 2018;39(1):47–56.
- Weerts J, Raafs AG, Sandhoefer B, et al. Retinal vascular changes in heart failure with preserved ejection fraction using optical coherence tomography angiography. *J Clin Med*. 2024;13(7):1892.
- Topaloglu C, Bekmez S. Retinal vascular density change in patients with heart failure. *Photodiagnosis Photodyn Ther*. 2023;42:103621.
- Kanar HS, Penbe A, Kanar BG. Subfoveal choroidal thickness and retinal nerve fiber layer alterations in chronic heart failure patients. *Arq Bras Oftalmol*. 2021;84(5):467–473.
- Barthelmes J, Nägele MP, Cantatore S, et al. Retinal microvascular dysfunction in patients with coronary artery disease with and without heart failure: a continuum? *Eur J Heart Fail*. 2019;21(8):988–997.
- Chandra A, Seidelmann SB, Claggett BL, et al. The association of retinal vessel calibres with heart failure and long-term alterations in cardiac structure and function: the Atherosclerosis Risk in Communities (ARIC) Study. *Eur J Heart Fail*. 2019;21(10):1207–1215.
- Guo S, Yin S, Song W, et al. Retinal microvascular abnormalities predict clinical outcomes in patients with heart failure. *Diagnostics*. 2022;12(9):2078.
- Kaya Ö, Kaya H. Stasis dermatitis: a skin manifestation of poor prognosis in patients with heart failure. *Hippokratia*. 2022;26(1):13–18.
- Matsuoka S, Kaneko H, Okada A, et al. Association of retinal atherosclerosis assessed using Keith-Wagener-Barker system with incident heart failure and other atherosclerotic cardiovascular disease: analysis of 319 501 individuals from the general population. *Atherosclerosis*. 2022;348:68–74.
- Rim TH, Oh J, Kang SM, Kim SS. Association between retinal vein occlusion and risk of heart failure: a 12-year nationwide cohort study. *Int J Cardiol*. 2016;217:122–127.

- [48] Wong TY, Rosamond W, Chang PP, et al. Retinopathy and risk of congestive heart failure. *JAMA*. 2005;293(1):63–69.
- [49] Chen Y, Yin M, Fan L, et al. Mirror-like tongue is an important predictor of acute heart failure: a cohort study of acute heart failure in Chinese patients. *J Tradit Chin Med*. 2023;43(6):1243–1251.
- [50] Wang BH, Sun LJ, Yu ZQ. Analysis of tongue manifestations in the treatment of congestive heart failure by enriching yin, warming yang, activating blood circulation and promoting urination. *Tianjin J Tradit Chin Med*. 1998;15(1):17–18.
- [51] Feng J, Zhang Y, Zhang J. Epidemiology and burden of heart failure in Asia. *JACC Asia*. 2024;4(4):249–264.
- [52] Yoo SGK, Lam CSP, Sweitzer NK. “Asian” heart failure. *Circulation*. 2024;150(3):177–179.
- [53] Klein R, Myers CE, Knudtson MD, et al. Relationship of blood pressure and other factors to serial retinal arteriolar diameter measurements over time: the beaver dam eye study. *Arch Ophthalmol*. 2012;130(8):1019–1027.
- [54] Myers CE, Klein R, Knudtson MD, et al. Determinants of retinal venular diameter: the Beaver Dam Eye Study. *Ophthalmology*. 2012;119(12):2563–2571.
- [55] Gopinath B, Chihai J, Plant AJ, et al. Associations between retinal microvascular structure and the severity and extent of coronary artery disease. *Atherosclerosis*. 2014;236(1):25–30.
- [56] Seidelmann SB, Claggett B, Bravo PE, et al. Retinal vessel calibers in predicting long-term cardiovascular outcomes: the atherosclerosis risk in communities study. *Circulation*. 2016;134(18):1328–1338.
- [57] De Backer D, Creteur J, Dubois MJ, Sakr Y, Vincent JL. Microvascular alterations in patients with acute severe heart failure and cardiogenic shock. *Am Heart J*. 2004;147(1):91–99.
- [58] Wijntjens GW, Fengler K, Fuernau G, et al. Prognostic implications of microcirculatory perfusion versus macrocirculatory perfusion in cardiogenic shock: a CULPRIT-SHOCK substudy. *Eur Heart J Acute Cardiovasc Care*. 2020;9(2):108–119.
- [59] Peng H, Yu W, Chen S, Zhang H. Development and application of a heart failure-specific information platform. *Chin J Med Sci Res Manag*. 2023;36(3):225–230.
- [60] Whiting PF, Rutjes AWS, Westwood ME, et al. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. *Ann Intern Med*. 2011;155(8):529–536.
- [61] Guyatt G, Oxman AD, Akl EA, et al. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol*. 2011;64(4):383–394.