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Bibliometric Analysis on the Integrated Chinese and Western Medicine Treatment of Alcohol Poisoning

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Abstract: *Objective*: To systematically analyze the research status, hot topics, and knowledge structure in the field of integrated Chinese and Western medicine for alcohol poisoning based on bibliometric methods, reveal the development context and integration trend of this field, and provide a reference basis for subsequent research. *Methods*: Relevant literature on integrated Chinese and Western medicine treatment of alcohol poisoning was retrieved from Chinese databases including CNKI, Wanfang, VIP, and international databases such as PubMed and Web of Science. The Sentence-BERT model was adopted for semantic vector encoding, combined with UMAP dimensionality reduction and HDBSCAN density clustering analysis. The c-TF-IDF algorithm was used to extract topic keywords, and topic similarity heat maps, document scatter plots, and hierarchical clustering dendrograms were constructed. *Results*: A total of 8 core research topics were identified. Western medicine emergency and clinical treatment systems (Topic 0–3) accounted for the mainstream of the literature, focusing on "treating symptoms" and clinical pathway management of acute poisoning. Studies on traditional Chinese medicine (TCM) and experimental pharmacology (Topic 4–5) focused on mechanism exploration and TCM intervention. Neural mechanism and rehabilitation management (Topic 6–7) paid attention to the deep-seated mechanism and long-term prognosis of diseases, which are currently weak research links. Semantic spatial analysis showed that there was an obvious "semantic gap" between the Western medicine emergency system and TCM traditional therapies, and a tight knowledge integration network had not been formed between the two. *Conclusion*: The current research on integrated Chinese and Western medicine for alcohol poisoning presents a pattern of "Western medicine dominating and TCM marginalized". There are problems such as disconnection between laboratory research and clinical practice, and insufficient connection between acute treatment and long-term rehabilitation. In the future, efforts should be made to build a full-cycle management model of "treating both symptoms and root causes", promote the clinical transformation of TCM pharmacological achievements, and reshape a three-dimensional diagnosis and treatment path including "TCM syndrome differentiation classification–Western medicine symptomatic support–TCM rehabilitation follow-up".

Keywords: Integrated Chinese and Western medicine; Alcohol poisoning; Bibliometrics; Topic clustering; Semantic analysis; Knowledge graph

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1. Introduction

Alcohol poisoning is one of the common critical and severe clinical diseases, including acute alcohol poisoning and chronic alcohol poisoning [1]. In severe cases, it can lead to central nervous system inhibition, respiratory and circulatory failure, and even death, bringing a heavy disease burden to patients' families and society. In recent years, with changes in people's lifestyles, the incidence of alcohol poisoning has increased year by year, becoming a global public health problem. According to statistics from the World Health Organization, about 3 million people die from alcohol-related diseases every year worldwide [2]. The prevention and treatment of alcohol poisoning and its complications have become the focus of the medical community.

In the clinical treatment of alcohol poisoning, naloxone is the preferred antidote in Western medicine, which plays an awakening role by antagonizing endogenous opioid peptides [3]. Meanwhile, supportive treatments such as gastric lavage, fluid infusion, and vitamin B_1 supplementation are combined, achieving remarkable results in acute-stage treatment. However, simple Western medicine treatment has certain limitations in improving patients' long-term prognosis, preventing relapse, and repairing neurocognitive damage. The treatment of alcohol poisoning with TCM has a long history. Records of "alcohol jaundice" can be traced back to *Synopsis of Prescriptions of the Golden Chamber*, and classic prescriptions such as Gegen Jiecheng Decoction are recorded in *Treatise on the Spleen and Stomach* [4,5]. Modern studies have shown that active ingredients of TCM such as puerarin and flavonoids have multiple pharmacological effects, including promoting ethanol metabolism, protecting liver cells, and resisting oxidative stress [6,7].

Integrated Chinese and Western medicine treatment of alcohol poisoning has unique theoretical advantages and clinical value. The combination of TCM's "holistic concept" and "treatment based on syndrome differentiation" with Western medicine's "precision intervention" can quickly relieve poisoning symptoms in the acute stage, and regulate visceral functions and improve patients' physical fitness in the recovery stage to reduce the relapse rate. In recent years, integrated Chinese and Western medicine schemes such as Xingnaojing Injection combined with naloxone and Compound Danshen Injection combined with naloxone have shown synergistic effects in emergency clinical application, which can effectively shorten patients' sobering time, improve oxidative stress indicators, and reduce adverse reactions [8–12].

Although the clinical practice of integrated Chinese and Western medicine in treating alcohol poisoning is increasingly abundant, there is a lack of systematic sorting of literature and in-depth analysis of knowledge structure in this field. As an important method to reveal the development law of disciplines and identify research frontiers, bibliometrics can intuitively present the distribution, evolution, and correlation characteristics of research topics through visualization means [13]. Based on this, this study adopts Sentence-BERT semantic vector encoding combined with UMAP dimensionality reduction and HDBSCAN clustering to conduct text mining and topic analysis on relevant literatures of integrated Chinese and Western medicine treatment of alcohol poisoning, aiming to clarify the knowledge topology of this field, identify research hotspots and weak links, and provide evidence-based basis for constructing a full-cycle integrated Chinese and Western medicine management model that treats both symptoms and root causes.

2. Research methods

2.1. Research process

The overall process of this systematic text mining method adopted in this study includes the following key

steps: original literature collection → text preprocessing → semantic vector encoding → high-dimensional data dimensionality reduction → unsupervised clustering analysis → topic feature extraction. Especially for the particularity of medical literature, a professional retrieval strategy was established to ensure data quality.

2.2. Literature retrieval strategy

2.2.1. Decomposition of core concepts

(1) Integrated Chinese and Western medicine

Combination of Chinese and Western therapies, integrative medicine, combination of traditional Chinese medicine and Western medicine.

(2) Alcohol poisoning

Alcohol dependence, alcoholism, ethanol poisoning, alcohol addiction.

(3) Treatment

Therapy, intervention, management, curative effect.

2.2.2. Database selection

(1) Chinese databases

CNKI, Wanfang, VIP, SinoMed.

(2) International databases

PubMed/MEDLINE, Embase, Web of Science, Scopus, Cochrane Library.

2.2.3. Retrieval formula

(1) Topic = (alcohol poisoning OR alcohol dependence OR ethanol poisoning OR alcohol abuse OR alcohol addiction OR alcoholism)

(2) Topic = (integrated Chinese and Western medicine OR combined Chinese and Western medicine OR traditional Chinese medicine and Western medicine OR integrative medicine OR Chinese and Western therapies)

(3) Topic = (treatment OR therapy OR intervention OR management OR curative effect) #1 AND #2 AND #3

2.3. Semantic vector generation: Text representation based on sentence-BERT

To obtain deep semantic features of texts, the Sentence-BERT (SBERT) model was adopted for text encoding. As an improved version of the BERT architecture optimized for sentence-level semantic representation, this model can generate 768-dimensional semantic embedding vectors. Compared with traditional word vector methods, SBERT can more effectively capture contextual semantic information of texts.

2.4. Dimensionality reduction: UMAP algorithm for high-dimensional space processing

To solve the problems of visualization and computational efficiency of high-dimensional semantic space, the UMAP (Uniform Manifold Approximation and Projection) algorithm was used for nonlinear dimensionality reduction. Based on manifold learning theory, this algorithm can reduce 768-dimensional semantic vectors to a 5–10-dimensional space suitable for subsequent clustering analysis on the premise of retaining the topological structure of the original high-dimensional space, significantly improving processing efficiency.

2.5. Topic clustering: Density adaptive clustering with HDBSCAN

The HDBSCAN (Hierarchical Density-Based Spatial Clustering of Applications with Noise) algorithm was used to perform unsupervised clustering in the reduced semantic space. Based on hierarchical density clustering, this method has the following advantages:

(1) Automatically determine the optimal number of clusters;
(2) Effectively identify clusters with different densities;
(3) Process noisy data. These characteristics make it especially suitable for text topic mining tasks.

2.6. Topic representation: c-TF-IDF keyword extraction algorithm

The class-based TF-IDF (c-TF-IDF) algorithm was adopted to extract topic keywords to form an interpretable topic representation. Improved on the basis of traditional TF-IDF, this method has the following characteristics:

(1) Take intra-class documents as calculation units;
(2) Fully consider the distribution of inter-class documents;
(3) Improve cross-class comparability through normalization processing. The final keyword set can effectively reflect the core semantic features of each topic.

3. Analysis results

3.1. Topic distribution

The visualization results after semantic vector generation and MDS dimensionality reduction intuitively reflect the correlation and distribution characteristics of different semantic topics in the literature set focusing on integrated Chinese and Western medicine for alcohol poisoning. See **Figure 1**.

Topic 0: Pathological mechanism and epidemiology, keywords: chronic alcohol poisoning, alcohol poisoning, drinking, damage, mental disorder. It has the largest bubble size, indicating that a large number of existing literature focuses on basic research, disease classification, and central nervous system damage such as mental disorders of alcohol poisoning, which is the cornerstone of the whole research field.

Topic 1: Western medicine intervention in the acute stage, keywords: naloxone, acute alcohol poisoning, sober up, symptoms, consciousness recovery. Its bubble size ranks second, showing that research on acute poisoning treatment highly relies on specific Western medicine intervention and its improvement of consciousness state [14,15].

Topic 2: Clinical first aid and nursing, keywords: nursing, acute alcohol poisoning, first aid, measures, treatment. Its bubble size ranks third, focusing on nursing measures and specific operational specifications in the first aid process. Although the bubble is relatively small, it supplements the practical details of “how to treat” in Topic 1.

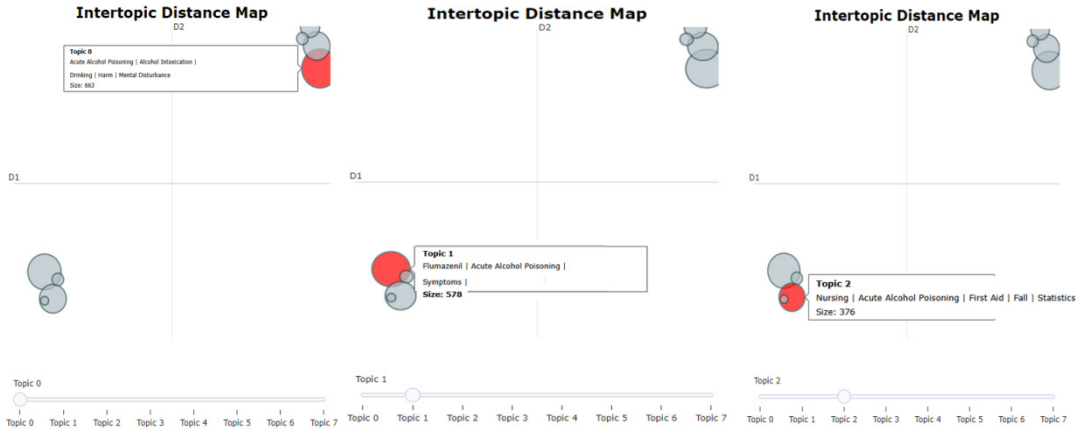

Figure 1. Topic distribution map.

3.2. Similarity heat map

The Pearson correlation coefficient heat map calculated from semantic vectors quantifies the semantic similarity among the 8 topics, as shown in **Figure 2**. The darker the dark blue color, the higher the similarity; the lighter the light green/white color, the lower the similarity.

Topic 0 (pathological mechanism) and Topic 3 (acute poisoning nursing) have extremely high similarity. Topic 0 focuses on chronic alcohol poisoning and mental disorders, while Topic 3 focuses on acute alcohol poisoning and nursing, indicating that the medical logic and nursing demands of existing literature are highly consistent whether discussing acute or chronic alcohol poisoning, forming a solid Western medicine clinical treatment foundation.

Topic 1 (naloxone) and Topic 2 (first aid measures) show dark blue with high similarity. The core word of Topic 1 is naloxone, a special Western medicine for acute alcohol poisoning with the function of sobering up, while the core words of Topic 2 are first aid and treatment, showing that drug therapy and clinical first aid operation are semantically bound, forming a complete Western medicine first aid closed loop.

Topics 4 to 7 related to TCM intervention and in-depth mechanism have obvious color gaps with other topics.

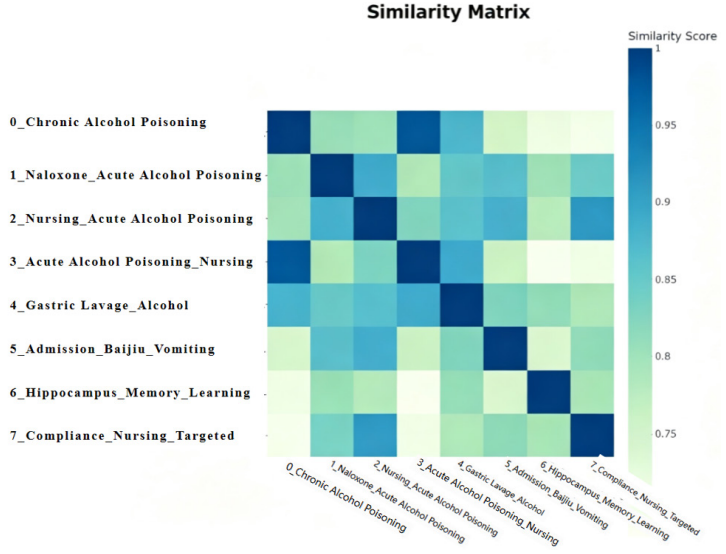

Figure 2. Topic similarity heat map.

3.3. Document visualization

The densely colored scatter points in **Figure 3** represent all included literature, which naturally gather into several obvious nebula clusters according to semantic similarity. Points of the same color represent the same topic, meaning documents under one topic have high semantic aggregation.

The left clusters (orange and red) are dominant: orange clusters correspond to chronic alcohol poisoning and mental disorders; red clusters correspond to nursing and first aid measures, reflecting that nursing operation and symptom performance are closely related in the treatment of acute alcohol poisoning.

The right green cluster is an independent system corresponding to naloxone and Xingnaojing, taking drug treatment as a relatively independent professional module.

Small-scale clusters include purple points (Topic 3) and yellow points (Topic 7). The purple cluster tries to break the boundary between chronic and acute alcohol poisoning and discuss comprehensive treatment schemes. The yellow cluster is far away from all other topics, corresponding to compliance and targeted intervention. Its extreme marginal position in semantic space reveals a blind spot in current research.

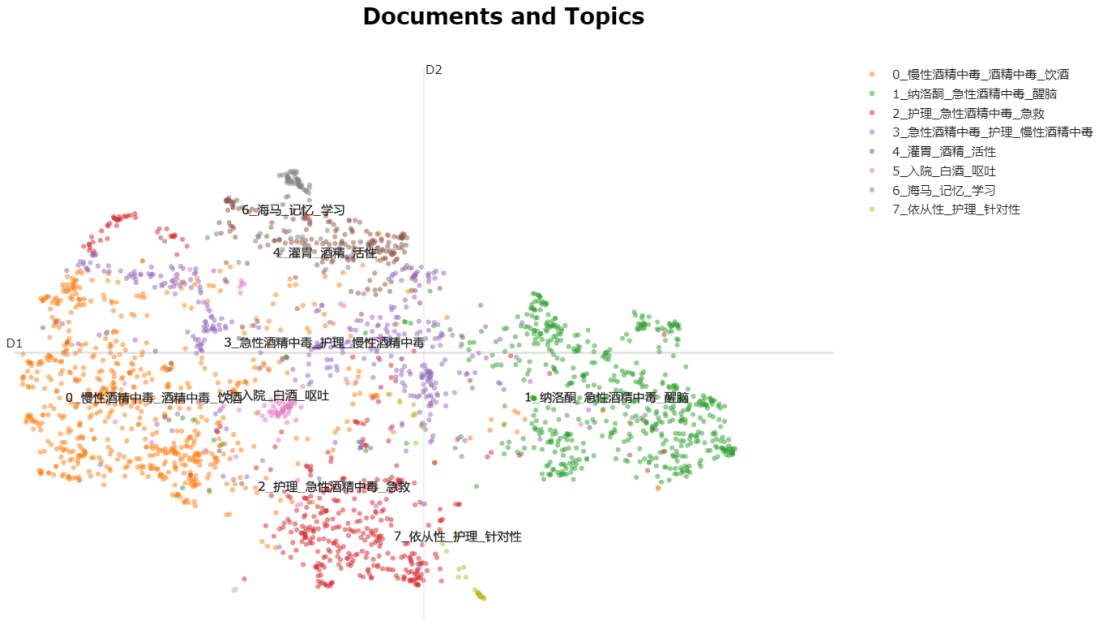

Figure 3. Document scatter plot.

3.4. Keyword extraction

The topic word score chart shows 8 core topics and their most representative high-frequency keywords extracted through semantic vector analysis, as shown in **Figure 4**.

The score of words directly reflects the core focus of each topic in the literature set.

Western medicine first aid and clinical treatment system (Topic 0, 1, 2, 3) account for the main part of the chart and constitute the absolute mainstream of existing research, focusing on treating symptoms and clinical path management of acute poisoning.

Topic 0 (pathology and epidemiology): chronic alcohol poisoning, alcohol poisoning, drinking, damage, mental disorder.

Topic 1 (core drug therapy): naloxone, acute alcohol poisoning, sober up, symptoms, consciousness

recovery.

Topic 2 (nursing and pre-hospital first aid): nursing, acute alcohol poisoning, first aid, measures, treatment, pre-hospital care.

Topic 3 (comprehensive clinical diagnosis and treatment): nursing, acute alcohol poisoning, chronic alcohol poisoning, ethanol, diagnosis, serum.

TCM and experimental pharmacology research (Topic 4, 5) are key areas to find breakthroughs for integrated Chinese and Western medicine, focusing on mechanism exploration and TCM intervention.

Topic 4 (TCM pharmacology and experimental research): intragastric administration, alcohol, activity, ethanol, tissue, liver, vitality, experiment.

Topic 5 (emergency clinical manifestations): admission, vomiting, blood pressure, limbs, pupil, bilateral pupil.

Neural mechanism and rehabilitation management (Topic 6, 7) focus on deep disease mechanism and long-term prognosis, which are weak research fields and potential application directions of TCM root-cause treatment.

Topic 6 (neurocognitive and brain injury): hippocampus, memory, learning, maze, learning and memory ability

Topic 7 (patient psychology and rehabilitation compliance): compliance, nursing, targeting, satisfaction, adverse events, psychology

Figure 4. Topic word score chart.

3.5. Hierarchical structure

The hierarchical clustering dendrogram constructed based on topic semantic similarity intuitively shows the affiliation and degree of difference of 8 topics through the merging distance of branches, as shown in **Figure 5**.

Red branches: Western medicine first aid system, including Topic 1 (naloxone/first aid drugs), Topic 2 (nursing/first aid measures) and Topic 7 (compliance/psychological nursing). In the current academic discourse system, Western medicine first aid has formed a mature and self-consistent closed loop covering

drug intervention, clinical operation, and later rehabilitation management, corresponding to the "treating acute symptoms" part and mainstream literature.

Intermediate transition branch: intersection of pathological mechanism and comprehensive clinical treatment. Topic 3 (comprehensive management of acute and chronic poisoning) separates from the first aid cluster early but is closely connected with Topic 0 (chronic poisoning/mental disorder), reflecting academic attention to the transformation between acute and chronic alcohol poisoning in clinical diagnosis and treatment. Topic 0 is relatively independent of specific first aid operations.

Blue branch: TCM and experimental research, which is an independent branch without early merging with Western medicine topics. TCM intervention mainly stays in laboratory pharmacological discussion and has not been deeply integrated into mainstream clinical first aid discourse.

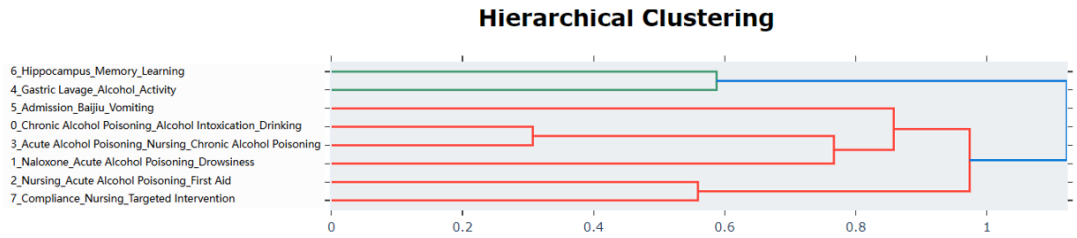

Figure 5. Hierarchical clustering dendrogram.

4. Discussion

4.1. Semantic spatial structure and integrated Chinese-Western medicine characteristics: From segmentation to integration

The semantic map constructed by Sentence-BERT reveals the unique knowledge topology of research on integrated Chinese and Western medicine for alcohol poisoning. The red bubble clusters representing core research hotspots present an obvious linear distribution extending from bottom left to top right on the coordinate axis. This spatial layout not only reflects the logical chain from the nursing/first aid process to drug therapy and pathological mental disorder, but also verifies that current research mainly focuses on clinical response in the acute stage and forms a stable Western medicine first aid paradigm.

However, there is an obvious spatial separation between the gray bubble clusters representing TCM therapies and the red core area. According to the multidimensional scaling principle, the physical distance directly quantifies low semantic similarity, revealing a prominent semantic gap between the Western medicine emergency system and TCM traditional therapies. The two have not formed a tight knowledge integration network and present a pattern of Western medicine dominance and TCM marginalization, resulting in a split academic research structure.

4.2. Closed loop reflected by similarity heat map

The similarity matrix further quantifies the segmentation phenomenon. The heat map shows strong dark blue correlation among Topic 0, Topic 1 and Topic 2, forming a closed and self-consistent Western medicine clinical loop. In contrast, Topic 4 (TCM active ingredient experiment), Topic 6 (neurocognition) and Topic 7 (rehabilitation compliance) show light cold colors with low similarity to the main cluster, which means there is a serious disconnection between laboratory TCM experimental research and clinical practice. Effective

active ingredients verified in experiments have not been transformed into clinical treatment schemes.

4.3. Semantic desert in document distribution map

The document visualization graph further confirms the existence of semantically isolated islands. There are large blank sparse areas between topic clusters, especially between nursing/pathology and drug therapy, lacking transitional literature. When discussing alcohol poisoning treatment, scholars tend to choose pure Western medicine first aid or pure TCM experiments, with insufficient transitional research such as integrated Chinese-Western emergency nursing and combined brain protection therapy.

5. Conclusion and prospect

5.1. Bridge the gap between laboratory research and clinical practice

Topic 4 (TCM active ingredient experiment) forms an independent branch in hierarchical clustering. Future research should explore how to transform TCM pharmacological achievements such as liver protection and sobering active ingredients into clinical scenarios of Topic 1 and Topic 2, e.g., exploring whether combined TCM preparations on the basis of naloxone first aid can shorten sobering time and reduce complications, realizing paradigm transformation from single Western medicine emergency to integrated Chinese-Western emergency treatment.

5.2. Build a full-cycle management model treating both symptoms and root causes

Topic 6 (hippocampus memory injury) and Topic 7 (patient compliance) are marginalized in existing literature, which is the advantage of TCM's preventive treatment and holistic view. After the acute treatment stage, TCM rehabilitation methods such as acupuncture and emotional nursing can be introduced to intervene in cognitive impairment involved in Topic 6, and TCM syndrome differentiation nursing can be adopted to improve patient compliance in Topic 7, filling the research gap between acute treatment and long-term rehabilitation.

5.3. Reshape clinical diagnosis and treatment path

Break the single Western medicine clustering structure and build a new semantic network including TCM syndrome differentiation classification, Western medicine symptomatic support, and TCM rehabilitation follow-up, so as to realize three-dimensional and in-depth integration of integrated Chinese and Western medicine in alcohol poisoning treatment.

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Disclosure statement

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