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Advances in Prevention and Treatment of Alzheimer's Disease among Community-Dwelling Elderly from the Perspective of Traditional Chinese Medicine (TCM)

Peihua Zhuang[1], Dongxing Wang[1], Shuyu Zhao[1], Ting Yuan[2*]

[1]Zhangjiang Community Health Service Center, Pudong New Area, Shanghai 201210, China
[2]Xinjing Town Community Health Service Center, Changning District, Shanghai 200335, China

**Author to whom correspondence should be addressed.*

Abstract: This article examines the progress in the prevention and treatment of Alzheimer's disease among elderly individuals in communities from the perspective of traditional Chinese medicine (TCM). Through a systematic review of recent related studies, it analyzes new insights into the etiology and pathogenesis of Alzheimer's disease within TCM and summarizes novel methods and achievements in the prevention and treatment of the disease using TCM. Based on the TCM principles of "preventive treatment" and holistic health, innovative intervention models with Chinese characteristics, such as the "brain-heart-kidney axis" and "brain-gut connection," have shown new breakthroughs in improving cognitive function and slowing disease progression. The article also explores the benefits of shifting preventive and therapeutic measures to earlier stages, contributing to the establishment of an integrated community prevention model of "prevention-intervention-rehabilitation."

Keywords: Traditional Chinese medicine; Community; Elderly; Alzheimer's disease; Prevention and treatment

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1. Introduction

Alzheimer's disease (AD) stands as one of the primary neurodegenerative disorders seriously threatening the health of elderly populations. With the intensification of global population aging, the prevention and treatment of AD have emerged as a critical public health challenge worldwide, while effective and definitive diagnostic or therapeutic solutions remain elusive. Traditional Chinese Medicine (TCM) demonstrates unique advantages in managing age-related diseases and has achieved remarkable progress in AD prevention and treatment in recent years [1]. This study aims to systematically summarize novel theories, innovative approaches, and emerging models

in community-based AD prevention and management for elderly populations from the TCM perspective. The research seeks to provide new insights and evidence for enhancing therapeutic outcomes, improving quality of life in aging populations, reducing disease burden, enriching treatment modalities, elevating health awareness in ecological communities, and fostering collective health benefits. These efforts may potentially pioneer new possibilities for AD prevention and treatment strategies.

2. New understandings of Alzheimer's disease pathogenesis from the perspective of traditional Chinese medicine (TCM)

This syndrome has been documented in classical literature under terms such as "forgetfulness" and "dementia." In traditional Chinese medicine (TCM) theory, it is understood to originate in the brain and involve dysfunction among the five viscera, primarily caused by deficiency of marrow sea (essence of the brain), obstruction of cerebral orifices by phlegm and stasis, and dysfunction of the spirit mechanism. Recent advances in TCM research have expanded understanding of Alzheimer's disease pathogenesis by integrating the brain-gut axis dysregulation theory. Building upon the traditional framework of "kidney essence deficiency, phlegm turbidity obstructing orifices, and blood stasis blocking channels," contemporary TCM scholars have proposed the concept of brain-gut axis imbalance. This innovative theory highlights the interconnected regulatory mechanisms between cerebral and intestinal functions, reflecting TCM's holistic perspective of visceral interdependence. Modern medicine has also termed the gastrointestinal tract the 'second brain' in research, reflecting its sophisticated neural networks and regulatory capacities comparable to those of the central nervous system [2].

Modern biomedical research has identified a bidirectional communication network comprising the gut microbiota, autonomic nervous system, central nervous system, and enteric nervous system [3]. This sophisticated system connects the brain and gastrointestinal tract through neuroendocrine, immunological, and metabolic pathways, collectively termed the microbiome-brain-gut axis. Within TCM's holistic framework, the concept of "gut" extends beyond anatomical intestines to encompass the functional spleen-stomach system (Pi Wei). Emphasizing that "the spleen-stomach are the postnatal foundation", TCM theory posits that robust spleen-stomach function serves as the basis for Qi and blood generation. "Classical Canon of Medicine (Leijing): Section" on Zangxiang states: "The small intestine is located below the stomach, receiving and containing the stomach's ingested grains. It differentiates clear and turbid essences: clear fluids seep forward (to distribute throughout the body), while turbid residues flow backward (to the large intestine).

Spleen Qi ascends while small intestine Qi descends, thereby enabling the transformation and transportation of substances, hence it is called "the organ of differentiation and transformation." After food intake, the spleen-stomach system transforms dietary grains into essence and Qi. The small intestine further segregates clear nutrients from turbid waste, while the large intestine transmits residual matter and absorbs remaining body fluids. These organs collaborate in maintaining physiological homeostasis through their interconnected functions. Additionally, "Suwen: Yin-Yang Correspondence and Manifestations" observes: "Anger injures the liver, joy affects the heart, overthinking harms the spleen, sorrow damages the lung, and fear weakens the kidney." As elaborated in "Jingyue Quanshu: Miscellaneous Diseases", dementia may arise from emotional blockages, excessive worry, unfulfilled desires, skepticism, or fright, gradually progressing to cognitive decline. Chronic emotional stress (e.g., prolonged anxiety) disrupts spleen function, leading to digestive disorders. Conversely, spleen-stomach dysfunction may impair cerebral function through Qi-blood deficiency or Qi stagnation, creating a

vicious cycle.

From TCM's holistic perspective, the brain-gut axis embodies multidimensional connections between the brain and intestines via Qi-blood circulation, Qi movement, and emotional regulation. By modulating spleen-stomach function, smoothing liver and Qi, and nourishing kidney essence, TCM interventions aim to restore brain-gut axis homeostasis, thereby preventing disease and promoting health. This integrative approach converges with modern research on the microbiome-brain-gut axis, offering innovative directions for Alzheimer's disease prevention and treatment.

3. Integrative traditional Chinese medicine (TCM) approaches to Alzheimer's disease

3.1. Therapeutic strategies and clinical efficacy

From the perspective of TCM syndrome differentiation, the development of Alzheimer's disease is closely associated with dysfunctions of the brain, kidneys, and heart [4]. The brain is regarded as the "residence of primordial spirit" (Yuan Shen Zhi Fu), the kidneys govern essence (Shen), and the heart presides over mental activities (Shen Ming). These three organs interact dynamically to maintain cognitive function.

According to Qianjin Yifang ("Supplement to the Thousand Ducal Prescriptions"): *"*After age fifty, Yang Qi declines progressively... leading to forgetfulness of past events." And Yifang Jijie ("Collected Explanations of Medical Formulas") states: "Both essence (Jing) and willpower (Zhi) reside in the kidneys. Deficiency of kidney essence leads to weakened willpower, failing to ascend to the heart, resulting in confusion and forgetfulness." The kidneys are considered the "foundation of prenatal constitution." They regulate growth, development, and aging through the waxing and waning of kidney and Qi.

Adequate kidney essence ensures abundant physical energy, vigorous brain function, and sharp mental acuity. Conversely, aging-related depletion of kidney essence, combined with spleen Qi deficiency, impairs Qi-blood generation. Deficient essence fails to nourish the marrow, leading to brain malnutrition, sensory orifices dysfunction, intellectual decline, and emotional disturbances. This TCM perspective aligns with modern gerontological understanding: age-related physiological memory decline and cognitive slowing are associated with neuronal loss, reduced brain weight, cortical atrophy, and narrowing gyri [5, 6]. These structural changes correspond to the TCM mechanisms of marrow sea deficiency, heart fire hyperactivity, and brain orifice dysfunction in elderly patients.

In recent years, traditional Chinese medicine (TCM) has made significant advances in the prevention and treatment of Alzheimer's disease. In terms of herbal interventions, multiple novel compound formulations have been developed, including Naoxintong capsules (NXTC), Yizhi Jiannao pills, Jiannao Yishen pills, Xingnao Yizhi capsules, Tianma Xingnao capsules, Haima Yizhi powder, and Compound Congrong Yizhi capsules [7–13]. These formulae are designed based on TCM theoretical principles combined with modern pharmacological research, demonstrating multi-target and multi-pathway mechanisms. Clinical studies confirm their significant efficacy in improving cognitive function and delaying disease progression. Notably, recent research has focused on modulating the gut microbiota environment to suppress excessive activation of intestinal glial cells and astrocytes, thereby preventing the progression of neuroinflammation. This approach aims to reduce peripheral immune cell infiltration into the brain and inhibit microglial inflammation in the central nervous system, ultimately lowering the incidence of late-stage AD-associated neuroinflammation and improving patients' cognitive function [14–17].

Extracts from *Magnolia officinalis* (Houpo), *Polygala tenuifolia* (Yuanzhi), *Nardostachys jatamansi* (Gansong), and algae (Sodium Oligomannate, extracted from algae) have been specifically reported for these effects.

In traditional non-pharmacological treatments, acupuncture and moxibustion have been shown to regulate cerebrovascular function, improve cerebral blood supply, inhibit neuroinflammation, reduce oxidative stress, promote neuroregeneration, protect neurons, and regulate neurotransmitters, thereby enhancing cognitive function. In recent years, various innovative techniques have been developed, such as electroacupuncture, laser acupuncture, and abdominal acupuncture [18–21]. These new techniques combine traditional acupuncture and modern theories with modern scientific technologies, enhancing therapeutic effects. Studies have indicated that electroacupuncture stimulation of specific acupuncture points can regulate gastrointestinal function [22, 23]. Acupuncture at Tianshu and Zusanli points not only increases the abundance of beneficial gut probiotics but also effectively alleviates gut microbiota dysbiosis. These interventions help maintain the integrity of neural networks and gastrointestinal cellular structures, thereby modulating the gut microbiota and improving cognitive function and quality of life in Alzheimer's disease patients. Furthermore, traditional Chinese medicine (TCM)-based therapies such as music therapy and aromatherapy have also been applied in the prevention and treatment of Alzheimer's disease, with certain achievements reported [24–28].

4. Community-based prevention and treatment model integrating traditional Chinese medicine theory

Traditional Chinese medicine (TCM) is an important component of excellent traditional Chinese culture. With the advent of the "health-centered" medical model, community-level disease prevention and treatment has increasingly demonstrated its cornerstone role. According to the data from the Seventh National Population Census, the population aged 65 and above in China has reached 13.50%, marking the country's entry into a deeply aging society. In the early stages of Alzheimer's disease among the elderly, symptoms are limited to memory impairment and inattention, which are easily overlooked as normal aging or stress-related and thus neglected. Furthermore, the lack of specific biomarkers and effective auxiliary diagnostic tools, coupled with the challenges in accurately diagnosing the disease through existing imaging and neuropeptide tests, makes early detection of Alzheimer's disease extremely difficult. Given this context, it is imperative to emphasize TCM's holistic concept and preventive healthcare principles ("treating before disease occurs"). Community-based interventions should prioritize identifying high-risk groups through analysis of TCM constitutional characteristics rather than relying solely on individualized syndrome differentiation. Population-oriented treatment models must integrate both symptom differentiation and TCM constitutional assessment to enhance preventive care effectiveness.

Traditional Chinese medicine (TCM) emphasizes individualized treatment through syndrome differentiation, where prevention and therapeutic strategies are tailored to patients' specific conditions. The holistic concept focuses on comprehensively assessing overall health status, prioritizing systemic functional regulation over isolated disease manifestations to enhance disease resistance. Through syndrome differentiation and treatment, early identification of disease risk factors and signs is possible. Through the holistic perspective, comprehensive regulation of the body's functional state and enhancement of immunity can be achieved, thereby preventing diseases.

Extracting traditional medications and treatment methods proven effective in clinical practice, advancing the treatment intervention to the preventive window period, leveraging modern technology and medicine-centered

multidisciplinary collaboration and integration, adopting the TCM concept of "preventive treatment of disease" to view the entire susceptible population, and combining modern community medical resources to provide dialectical solutions can enrich the new integrated community prevention and treatment model of "prevention-intervention-rehabilitation," potentially becoming a new breakthrough in Alzheimer's treatment and intervention with Chinese characteristics to improve cognitive function and delay disease progression.

In the prevention phase, high-risk individuals are identified through TCM constitution identification and risk assessment, and personalized prevention plans are developed. These plans include TCM health guidance, emotional regulation, and exercise therapy, aiming to delay cognitive decline and prevent the occurrence of Alzheimer's disease. In the intervention phase, an integrated traditional Chinese and Western medicine approach is adopted to develop individualized treatment plans for patients at different stages. These plans include Chinese herbal medicine treatment, acupuncture therapy, cognitive training, etc., aiming to improve cognitive function and delay disease progression. In the rehabilitation phase, emphasis is placed on functional recovery and improved quality of life. With the help of TCM rehabilitation techniques such as Tui Na (Chinese massage) and Qigong (breathing exercises), combined with community support services, patients are assisted in maintaining daily living abilities and reducing the burden on families and society.

5. Conclusion

Alzheimer's disease in the elderly is a complex pathological process characterized by multifactorial etiology, multisystemic involvement, and progressive, fulminant, and severely debilitating clinical trajectories. This study systematically reviews recent advances in community-based prevention and treatment of Alzheimer's disease from the perspective of traditional Chinese medicine (TCM). Modern TCM research has deepened understanding of the disease's pathogenesis through integrative studies combining classical theories with modern physiological and pharmacological mechanisms. Notably, innovative theories such as brain-gut axis dysregulation have emerged, alongside novel therapeutic approaches and empirical evidence that revitalize classical formulas through scientific exploration. Future research should focus on elucidating the precise mechanisms of TCM interventions, optimizing community-based prevention models, and providing more robust scientific evidence to enhance treatment efficacy and improve the quality of life for elderly patients.

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Disclosure statement

The authors declare no conflict of interest.

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