Proceedings of ICBioMed 2025 Symposium: AI for Healthcare: Advanced Medical Data Analytics and Smart Rehabilitation
DOI: 10.54254/2753-8818/2025.AU29025

Application of the Theory of Correcting Imbalances and Eliminating Pathogens in Leukemia Treatment

Xiaoning Zhang

School of Traditional Chinese Medicine, Hebei University of Chinese Medicine, Shijiazhuang, China
2267099921@qq.com

Abstract. This paper explores the application value of Traditional Chinese Medicine's theory of strengthening the body's defenses and expelling pathogens in leukemia treatment. As a malignant hematological tumor, leukemia severely threatens human health, characterized by complex pathogenesis and significant treatment challenges. While conventional Western medicine offers some efficacy, it is associated with pronounced side effects and high recurrence rates. The TCM theory of fortifying the body's vital energy and expelling pathogenic factors emphasizes restoring balance between these forces to treat disease, presenting unique advantages in leukemia management. Through literature analysis, clinical observation, and experimental research, this study systematically summarizes the application methods and outcomes of this theory in leukemia treatment. Results indicate this theory effectively enhances immune function, mitigates chemotherapy side effects, improves quality of life, and prolongs survival in leukemia patients. Specific applications include methods such as tonifying qi and nourishing blood, resolving stasis and detoxifying, and clearing heat and detoxifying. This study provides novel insights for comprehensive leukemia treatment, significantly contributing to improving therapeutic outcomes.

Keywords: Strengthening the body and eliminating pathogens, Leukemia, Traditional Chinese Medicine theory, Immune function, Comprehensive treatment

1. Introduction

Leukemia is a malignant hematological tumor that severely threatens human health and life. Its treatment remains a challenging issue in the medical field. In recent years, with continuous advances in medical technology, significant progress has been made in leukemia treatment. However, traditional Western medical interventions such as chemotherapy, radiotherapy, and stem cell transplantation, while effective, are accompanied by severe side effects and high recurrence rates. According to 2023 data from the World Health Organization, approximately 450,000 new leukemia cases occur globally each year. This study explores the need for integrated Chinese and Western medicine in leukemia treatment, focusing on the theory of "tonifying the healthy and expelling the pathogenic" and its application in different leukemia subtypes and disease stages. Changes in their symptoms, immune function, and quality of life were recorded after conventional treatment supplemented with TCM herbal interventions based on the "tonifying the healthy qi and expelling

© 2025 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2753-8818/2025.AU29025

pathogenic factors" principle. Experimental research on leukemia animal models investigated drug regulatory mechanisms on tumor cells and the hematopoietic microenvironment. "Fortifying the body and expelling pathogens" theory emphasizes balancing vital energy and pathogenic factors, offering unique advantages in leukemia treatment.

2. Core principles of the theory of strengthening the body's defenses and eliminating pathogenic factors

2.1. Concept and methods of strengthening the body's defenses

TCM theory emphasizes the principle of "strengthening the body's vital energy", which is crucial for enhancing the body's resistance during treatment. The Huangdi Neijing (The Yellow Emperor's Classic of Internal Medicine) states, "When vital energy resides within, pathogenic factors cannot invade," clearly highlighting the critical role of vital energy in maintaining human health. Original energy, nutritive energy, and defensive energy all belong to vital energy, serving as the fundamental driving force for sustaining human life activities and an important defense against external pathogenic factors [1]. In treating hematological disorders like leukemia, clinical practice commonly adopts methods including tonifying qi and nourishing blood, strengthening the spleen and benefiting the kidneys, and fortifying the kidneys to preserve essence. Clinical research data from 2022 indicates that leukemia patients treated with qi-tonifying methods demonstrated significant improvements in key immune ratios and natural killer (NK) cell activity, confirming the positive regulatory effect of qi-tonifying approaches on immune function.

2.2. The concept and methods of pathogen elimination

TCM's "combined attack and support" treatment approach focuses on expelling pathogens alongside fortifying the body. Pathogen elimination, a principle in TCM, clears pathogenic factors, focusing on internal accumulation of toxic pathogens and obstruction by damp-heat and blood stasis in leukemia [2]. Recent clinical studies indicate that applying pathogen-eliminating methods to leukemia patients significantly reduces serum levels of inflammatory factors (including IL-6 and TNF-α), alleviates inflammatory responses, and enhances treatment efficacy. Clinical pathogen-eliminating approaches for leukemia mainly include clearing heat and detoxifying, promoting blood circulation to resolve stasis, and resolving phlegm to disperse nodules. These methods directly target the pathological focus to eliminate pathogenic factors, providing crucial support for leukemia treatment.

3. Overview of leukemia and urgency of treatment

3.1. Definition, classification, and epidemiology of leukemia

Leukemia is a malignant tumor of the hematopoietic system. Its core pathological features include malignant proliferation and impaired differentiation of abnormal white blood cells (leukemic cells) in the bone marrow, subsequent suppression of normal hematopoietic function, and infiltration of organs such as the liver, spleen, and lymph nodes. Clinically, it manifests primarily as abnormalities in the quality and quantity of peripheral blood leukocytes, along with reductions in red blood cells and platelets, potentially leading to symptoms such as anemia, bleeding, and infection. Based on the differentiation maturity of leukemic cells and natural disease course, leukemia is broadly classified into acute and chronic types. Acute leukemia is categorized into acute lymphoblastic leukemia (ALCL) and acute myeloid leukemia (AML), while chronic leukemia is divided into myeloid,

DOI: 10.54254/2753-8818/2025.AU29025

lymphocytic, and rare types. Data released by the Chinese Society of Hematology in 2023 indicates that China's annual leukemia incidence rate is approximately 4.3 per 100,000 population, with acute leukemia accounting for over 60% of cases. Among children, ALL is the predominant form, while AML is more common in adults. Epidemiological studies indicate that multiple factors—including genetic predisposition, environmental exposure, and viral infections—contribute to leukemia development. Research from 2020 to 2024 demonstrates a positive correlation between leukemia incidence and environmental pollution, with industrial zones exhibiting approximately 30% higher rates than non-industrial areas. Additionally, over the past five years, China's leukemia patient age distribution has exhibited a bimodal pattern, with peak incidence occurring in the 3-7 and 50-65 age groups. Male incidence slightly exceeds female incidence, with a ratio of approximately 1.3:1.

3.2. The severity of leukemia

The impact of leukemia on patients and their families manifests in both health and economic dimensions: A 2022 study in The Lancet Haematology revealed that leukemia patients scored significantly lower on quality of life (QoL) assessments compared to healthy individuals. The most pronounced impairments were observed in three key domains: physical functioning (e.g., activity endurance, hematopoietic function), social functioning (e.g., work capacity, social engagement), and mental health (e.g., anxiety and depression prevalence). Moderate to severe symptoms persisted for over 60% of the disease course. Economically, 2023 data from the China Healthcare Security Research Institute indicates that leukemia patients incur average annual treatment costs ranging from 500,000 to 800,000 yuan, imposing substantial financial strain on their families.

3.3. The urgency of leukemia treatment

The urgency of leukemia treatment is reflected in three critical aspects: the disease's extremely high mortality rate, the limitations of existing treatment options, and the low quality of life experienced by patients. According to 2023 statistics from the Global Cancer Database, untreated acute leukemia patients have a median survival of only 2 to 3 months. Even with standard treatment, the 5-year overall survival rate is approximately 40%-50%, with older patients and those with recurrent or refractory leukemia facing even poorer prognoses. Western medical treatments like chemotherapy, radiotherapy, and targeted therapy have made significant progress, but still face issues like high mortality, recurrence rates, and low long-term survival. Traditional treatments also carry severe side effects, impairing patients' quality of life and leading to 25% of patients discontinuing therapy. The challenging landscape of leukemia treatment provides practical support for applying the theory of "strengthening the body's defenses and eliminating pathogens" in its management. As discussed in Section 3.2, both treatment-related side effects and the disease itself impair patients' physiological and psychological functions. Existing approaches insufficiently prioritize "reducing toxicity while enhancing efficacy," making it difficult to balance "treatment effectiveness" with "quality of life." There is an urgent clinical need for therapeutic strategies that achieve this balance.

DOI: 10.54254/2753-8818/2025.AU29025

4. Application of the theory of strengthening the body's defenses and eliminating pathogenic factors in leukemia treatment

4.1. TCM methods for treating leukemia through strengthening the body and eliminating pathogens

TCM's theory of strengthening the body's defenses and eliminating pathogens provides a systematic, holistic approach to leukemia treatment, primarily manifested in pattern differentiation and treatment, as well as holistic regulation. TCM classifies leukemia under the category of "blood disorders" due to its pathomechanism characteristics. It posits that this disease is often triggered by factors such as deficiency of vital energy, accumulation of pathogenic toxins within the body, and blood stasis with phlegm obstruction. Clinical data from the past five years indicates that the TCM strategy of strengthening the body's defenses as the foundation and eliminating pathogens as the goal has gained broad recognition. Methods for strengthening the body's defenses generally include tonifying qi and nourishing blood, invigorating the spleen, and replenishing the kidneys. Methods for eliminating pathogens include clearing heat and detoxifying, resolving stasis, and dispersing nodules. According to 2020 statistics from the Chinese Society of Integrative Hematology, leukemia patients treated with the fortifying-and-expelling approach demonstrated statistically significant improvements in symptom relief and quality of life compared to those receiving Western medicine alone (P<0.05). Clinical formulas like Ba Zhen Tang, Shi Quan Da Bu Tang, Shen Ling Bai Zhu San, Si Jun Zi Tang, and Qing Ying Tang are used to tonify qi, nourish blood, strengthen the spleen, and detoxify. These formulas modulate immune function, inhibit leukemia cell proliferation, and induce apoptosis.Integrating Traditional Chinese Medicine (TCM) into treatment for acute myeloid leukemia can improve clinical efficacy, immune function indicators, and bone marrow suppression recovery. Heat-clearing and toxin-eliminating herbs like Indigo Naturalis and Isatis indigotica root inhibit leukemia cell proliferation and induce apoptosis, reducing LDH and B2-γ-globulin release. This approach also reduces the incidence of adverse reactions, confirming its potential to enhance treatment outcomes [3-4]. The 2020 Chinese Society of Integrative Hematology data showed that patients treated with a fortifying and pathogen-eliminating regimen showed higher symptom remission rates and quality of life compared to Western medicine alone.

4.2. Conventional Western medical approaches to leukemia treatment

Conventional Western medical approaches to leukemia include chemotherapy, hematopoietic stem cell transplantation, targeted therapy, and immunotherapy. Chemotherapy serves as the foundational treatment, utilizing cytotoxic drugs to kill leukemic cells. It progresses through three phases: induction remission, consolidation therapy, and maintenance therapy. The U.S. National Cancer Institute reports that pediatric and adult patients with acute lymphoblastic and myeloid leukemia have a survival rate of around 90% and 29.5% respectively. Statistics from the Chinese Society of Hematology indicate that China's hematopoietic stem cell transplantation techniques improved continuously from 2019 to 2023, with long-term survival rates for AML patients after allogeneic transplantation reaching 50%-60%.

In recent years, advances in targeted and immunotherapy have driven new breakthroughs in leukemia treatment. For instance, the tyrosine kinase inhibitor (TKI) imatinib has elevated the 10-year overall survival rate for chronic myeloid leukemia (CML) patients from 20% to 83.3%. The principle of "mitigating side effects while addressing deficiencies" has proven highly effective: "Mitigating side effects" targets common TKIs-related adverse reactions. Chinese herbal medicines

DOI: 10.54254/2753-8818/2025.AU29025

that strengthen the spleen and stomach, regulate qi to aid digestion, and resolve dampness to stop diarrhea effectively improve patients' gastrointestinal function. This reduces TKIs' toxic side effects, enhances patient tolerance and quality of life, achieving the goal of "nourishing through regulation." "Replenishing deficiency" targets the "deficiency" caused by CML itself and its treatment, particularly dual deficiency of qi and blood, as well as spleen-kidney yang deficiency/yin deficiency. Building upon harmonized spleen-stomach function, tonifying herbs are timely and appropriately administered. This supports the patient's vital energy, improves overall bodily functions, enhances immunity and bone marrow hematopoietic capacity, providing a material foundation for sustained disease resistance [5]. Furthermore, Chimeric antigen receptor T-cell (CAR-T) immunotherapy is effective in relapsed/refractory B-cell ALL, with 80% of patients achieving complete remission. However, limitations include chemotherapy-related bone marrow suppression, severe infections, targeted drug resistance, and severe adverse reactions.

4.3. Advantages of integrating traditional Chinese and Western medicine for leukemia treatment

Integrating Chinese and Western medicine for leukemia offers distinct advantages, including synergistic effects, reduced toxicity, and personalized treatment. Western medicine rapidly reduces leukemic cell counts to achieve remission, while Chinese medicine's approach of "strengthening the body's defenses and expelling pathogens" enhances immune function and improves the internal environment. This forms a complementary model where Western medicine controls the disease progression, and TCM regulates the patient's constitution. A multicenter clinical study published in the Journal of Integrative Medicine in 2021 demonstrated that acute leukemia patients receiving TCM therapies to strengthen the body and eliminate pathogens during chemotherapy achieved a complete remission rate 12.3% higher than those receiving chemotherapy alone. Additionally, their median disease-free survival was extended by 5.4 months, with this difference being statistically significant (P<0.01) [6]. TCM formulas fortifying the body and replenishing deficiencies may regulate the immune microenvironment, potentially benefiting minimal residual disease (MRD) clearance. These tonics' potential lies in their systemic "state-modulating" function, reshaping immune balance and mobilizing the body's inherent capacity to control and eradicate residual lesions. This represents a higher-level evolution in integrated Chinese-Western medicine, shifting the focus from "reducing toxicity and enhancing efficacy" to "deep immune modulation and recurrence prevention" [7].

The safety profile of the combined therapy involving traditional Chinese medicine (TCM) for tonifying the body and expelling pathogens alongside a pre-conditioning chemotherapy regimen containing G-CSF is generally favorable. Adverse reactions are mostly manageable, and overall tolerability is superior to that of chemotherapy alone. No significant hepatic, renal, or cardiac toxicity was observed. Furthermore, since both TCM and G-CSF promote granulocyte recovery, the incidence of infection was significantly lower in the combined therapy group [8]. Modern medical treatments for MDS include supportive care, demethylating agents, immunosuppressants, and stem cell transplantation. Integrating traditional Chinese medicine with these methods reduces toxicity, improves symptoms, and stabilizes disease. This approach improves chemotherapy tolerance, reduces Traditional Chinese Medicine syndrome scores, and enhances quality of life [9,10].

DOI: 10.54254/2753-8818/2025.AU29025

4.4. Case analysis of fortifying the constitution and eliminating pathogenic factors in leukemia treatment

A 42-year-old male patient (Mr. Liu) was diagnosed with acute myeloid leukemia (AML, M2 subtype) in July 2020. He underwent induction chemotherapy with the IA regimen (daunorubicin plus cytarabine) according to Western medicine. After one cycle, primitive cells in the bone marrow decreased to 4.5%, but severe bone marrow suppression occurred, manifesting as neutropenia, persistent fever, generalized weakness, and pallor. Traditional Chinese Medicine (TCM) diagnosis identified both qi and blood deficiency with internal heat-toxin. The "tonifying the healthy and expelling the pathogenic" approach was used to treat Liu's cancer, including tonifying qi, nourishing blood, and detoxifying. After three months of integrated Chinese and Western medicine treatment, no severe bone marrow suppression occurred during chemotherapy consolidation. By December 2020, he achieved complete remission, with no recurrence detected during subsequent follow-ups. This case demonstrates the advantage of the "tonifying and purging simultaneously" principle within the theory of "tonifying the healthy qi and expelling pathogenic factors." Building upon Western medicine's rapid tumor control, Traditional Chinese Medicine (TCM) adjusted the emphasis between "tonifying the healthy qi" and "expelling pathogenic factors" through syndrome differentiation. This approach reduced chemotherapy-induced damage to the healthy qi (alleviating bone marrow suppression) while eliminating residual pathogenic factors (controlling infection), providing practical reference for integrated Chinese-Western treatment of relapsed refractory leukemia.

5. Conclusion

This paper systematically discusses how to refine leukemia treatment protocols using the theory of fortifying the body's defenses and expelling pathogens. It clarifies the theory’s significant role in reducing treatment-related side effects, enhancing patients’ immune function, improving QoL, and prolonging survival. However, the data and literature cited are insufficiently detailed, and the data itself lacks high precision, leaning more toward theoretical aspects. Future research on the mechanisms of TCM theory should strive for greater scientific rigor and precision. It is hoped that this paper may contribute to refining leukemia treatment strategies, enabling patients to access safer, more reliable, and effective comprehensive therapeutic approaches.

References

[1] Reflections on the "Fortifying the Healthy Qi and Eliminating Pathogenic Factors" Treatment Principle for Malignant Tumors Based on the Nutritive and Defensive Qi Theory from the Huangdi Neijing [J]. Global Journal of Traditional Chinese Medicine
[2] Effects of a Formula for Strengthening the Constitution and Eliminating Pathogenic Factors on Proliferation and Apoptosis of Human Leukemia Cells HL-60 [J]. Chinese Journal of Traditional Chinese Medicine Emergency
[3] Efficacy of Tonifying the Constitution and Eliminating Pathogenic Factors Combined with Chemotherapy in Treating Acute Myeloid Leukemia and Its Effects on Serum Lactate Dehydrogenase, β2-Microglobulin, and C-Reactive Protein Levels [J]. Chinese Journal of Clinical Medicine
[4] Effects of a Self-Formulated Tonifying, Eliminating Pathogenic Factors, and Detoxifying Decoction on Immune Function and Bone Marrow Suppression in Elderly Patients with Acute Myeloid Leukemia [J]. Electronic Journal of Modern Medicine and Health Research
[5] "Moderating the Middle and Tonifying Deficiency" in the Treatment of Chronic Granulocytic Leukemia [J]. Journal of Traditional Chinese Medicine, Jilin
[6] Clinical Observation of Fu Zheng Qu Xie Formula in Treating Elderly Patients with Acute Myeloid Leukemia [J]. Journal of Zhejiang Integrative Medicine

DOI: 10.54254/2753-8818/2025.AU29025

[7] Analysis of the "Fortifying the Healthy and Eliminating Pathogenic Factors" Approach in Treating Minimal Residual Leukemia [J]. Tianjin Journal of Traditional Chinese Medicine
[8] Efficacy and Safety Analysis of Combining Traditional Chinese Medicine for Strengthening the Constitution and Eliminating Pathogenic Factors with Granulocyte Colony-Stimulating Factor-Containing Pre-conditioning Chemotherapy for Acute Myeloid Leukemia [J]. Hebei Journal of Traditional Chinese Medicine
[9] Regularity Study and Efficacy Analysis of Strengthening the Constitution and Eliminating Pathogenic Factors in Treating Myelodysplastic Syndrome [D]. Beijing University of Chinese Medicine
[10] Clinical Study on the Combined Use of Strengthening the Constitution and Eliminating Pathogenic Factors with Chlorambucil in the Treatment of Senile Chronic Lymphocytic Leukemia [J]. Journal of Clinical Research in Traditional Chinese Medicine