

Visual Analysis of Pediatric Diarrhea Treated with Traditional Chinese Medicine Based on Citespace

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Abstract: In order to analyze the overview and potential development trends of research on traditional Chinese medicine treatment for pediatric diarrhea by using Citespace. We retrieved CNKI, VIP, Wanfang data and SinoMed self-built database about the treatment of pediatric diarrhea by traditional Chinese medicine from April 13, 2023 to April 13, 2023. After introduction and screening by NoteExpress, quantitative analysis was carried out by Citespace 6.1.R6, and the knowledge graph of authors, institutions and keywords was drawn. Resultly, a total of 7 high-frequency keywords, which are as follows: Massage, Umbilical application, Autumn diarrhea, Acupuncture treatment, Smecta, Shenque acpoint (RN8), Enema. We obtained 10 valid clusters of keywords. In the keyword co-occurrence analysis, a total of 17 surge keywords were identified. In conclusion, the cross-regional research team of traditional Chinese medicine in the treatment of pediatric diarrhea is relatively scarce, and there is still more room for development in the integration of the concepts of traditional Chinese and western medicine and to explore the nature and objective material basis of disease symptoms. The research of high-yield authors has not played a mainstream leading role in the theme of this study, and there is still a big gap between the number of publications stipulated by Price's law. The focus of the research focuses on the external treatment of traditional Chinese medicine, such as umbilical application and massage, which is more suitable for the humanistic care of modern clinical diagnosis, as well as the acceptance of children and their families. New research directions worth developing include children's acupuncture techniques and moxibustion techniques suitable for children, as well as dialectical application of traditional Chinese medicine and massage acupoints and technique.

1. Introduction

Pediatric diarrhea is one of the most common diseases in infants and young children in China. It is a digestive tract syndrome characterized by increased frequency of bowel movements, thin or

watery stools, caused by multiple pathogens and factors. Infants and young children aged 6 months to 2 years have a high incidence rate, accounting for about half of the cases in children under one year old. Traditional Chinese medicine theory believes that "Without dampness, there can't be diarrhea; when dampness accumulates, it leads to watery diarrhea" [1]. Dampness pathogen disrupts the normal fluid metabolism and is the primary pathological factor causing diarrhea. Dampness belongs to Yin pathogen and easily impairs Yang Qi, leading to sticky and persistent diseases. It is one of the main causes of malnutrition and growth disorders in children, significantly impacting their health and quality of life. Numerous clinical studies have shown that Traditional Chinese Medicine treatment has significant efficacy and advantages in the management of pediatric diarrhea [2-4].

The information in traditional Chinese medicine belongs essentially to knowledge-intensive data, characterized by integrality, complexity, and correlations [5]. Citespace is a tool used for visualizing and analyzing scientific literature information, providing a visual representation of the knowledge framework, patterns, and distribution within a scientific field. It enables in-depth exploration of hot topics, scientific frontiers, and research trends in the field using visualization technique [6]. The aim of this study is to utilize the visualization and mapping functions of Citespace to conduct a visual analysis of the literature on traditional Chinese medicine as the main treatment for pediatric diarrhea over the past 30 years. The study aims to explore the collaboration patterns among authors and institutions in this research field, as well as the dynamics and hot topics in TCM treatment of pediatric diarrhea.

2. Methods

2.1. Sources of Literature and Search Methods

We retrieved relevant literature on the treatment of pediatric diarrhea with Traditional Chinese Medicine from the China National Knowledge Internet (CNKI), Chinese Scientific Journal Database (VIP), China Academic Journals Database (Wanfang Data), and the China Biomedical Literature Service System (SinoMed) self-built databases up to April 13, 2023. The search terms for CNKI, VIP, and Wanfang databases were: "pediatric diarrhea" AND "Traditional Chinese Medicine" OR "Chinese medicine" OR "integrative medicine", while the search terms for SinoMed were: "pediatric diarrhea" AND "traditional Chinese medicine" AND "Chinese medicine" AND "integrative medicine". The search was conducted on April 13, 2023.

2.2. Inclusion and Exclusion Criteria

The inclusion criteria are literature research on the treatment of pediatric diarrhea with traditional Chinese medicine. The treatment is based on traditional Chinese medicine and has been published in core journals of Peking University, CSSCI, and CSCD. This includes case studies, animal experiments, clinical experience reports, academic discussions, and review articles. Conference papers, dissertations, platform submissions, and achievement documents are excluded.

2.3. Data Processing and Technical Approach

This article will include literature exported in NoteExpress format, imported into the NoteExpress software for secondary literature screening, with a total of 55 duplicate literatures removed after screening, and 2 updated literatures without authors. Authors were retrieved from the Wanfang database and added to the translated name row. The literature was then imported into the Citespace 6.1.R6 for format conversion. In Citespace 6.1.R6, the "Time Slicing" was set to 1989-2022, with "Year Per Slice" set to 1 year. For node type "author," the pruning method was set to none, and "g-

index K" was set to 25; for node type "keywords", the pruning methods used were Pathfinder, Pruning the Merged Network, with "TOP N" set to 50, and "g-index K" set to 25. The rest were set to default parameters. Visualization was conducted using authors, institutions, and keywords as nodes, obtaining co-occurrence network and clustering map, as well as burst map related to the treatment of pediatric diarrhea in traditional Chinese Medicine. Following the inclusion and exclusion criteria and data standard principles, this study conducted manual screening and data cleaning, obtaining an effective list of Chinese literature titles and locking the database. See Figure 1 for the process.

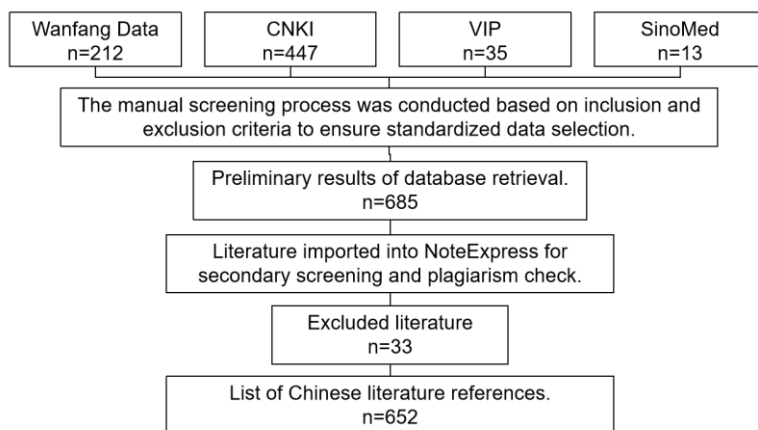


Figure 1: Flowchart of literature retrieval and screening process for research on Traditional Chinese Medicine treatment for pediatric diarrhea

3. Data Analysis and Graph Interpretation

3.1. Publication Time Distribution and Trends

A total of 707 relevant topic-related articles were retrieved, and after screening, 55 articles were excluded, leaving a total of 652 articles included. The publication time of the included articles was statistically analyzed, as shown in Figure 2.

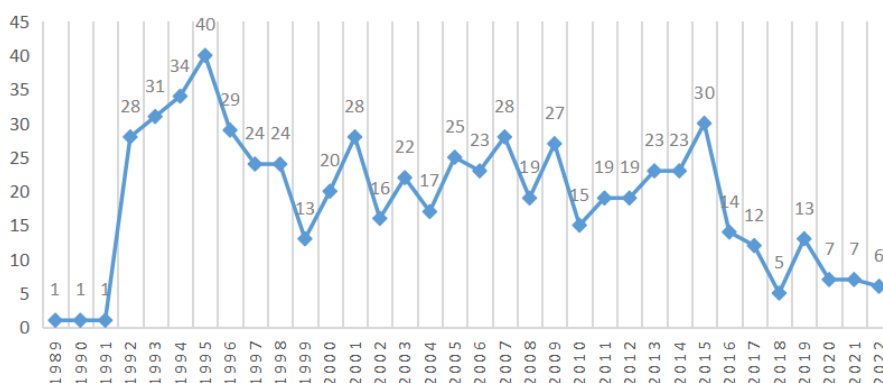


Figure 2: Trend chart of publication volume

Research on the treatment of pediatric diarrhea with traditional Chinese medicine began as early as 1989. From 1992 to 1995, it entered a phase of rapid development, with the highest number of publications reaching 40 in 1995. Subsequently, from 1996 to 2010, the number of publications fluctuated around 24. After 2010, there was a stepwise increase in the number of publications, reaching the second peak in the field of research on this disease in 2015. However, there was still a gap of 10 articles compared to the peak in 1994. After 2015, there was a sharp decline, with only

minor fluctuations between 2016 and 2019. Afterward, it remained in a relatively stagnant state, but overall, there was an upward trend.

3.2. Co-occurrence and Collaboration Network Analysis of Authors

Co-occurrence analysis of authors can reflect the core authors in a certain field and the strength of collaboration among authors. The number of publications is represented as the size of the node, and the thickness of the connection line reflects the degree of collaboration. The color and darkness of the nodes reflect the time of publication, with darker colors indicating earlier publication dates. In the 652 articles presented, there are 783 co-occurring authors, with 783 nodes and 648 connections in the network, and a network density of 0.0021. There were 10 authors with more than 3 articles (Table 1), among which Liu Li (7 articles) and Liu Qiang (6 articles) were the authors with the largest number of articles in the field of traditional Chinese medicine treatment of pediatric diarrhea. Liu Li, Liu Qiang, Chen Yuyao, Zou Zhipeng, Liu Huimin, Chen Siwei, Zhang Lu, Zhu Hongxia, Liu Binyuan, Li Xiuliang, Zhao Qiong, Ddong Jiye, Zheng Hanxiao, Dong Youqi, Hao Haiying, Yang Shizhen and Huang Junmin form the author groups. From 2013 to 2015, a research group composed of Liu Li, Liu Qiang, and others conducted in-depth studies on the use of traditional Chinese medicine patching therapy for pediatric diarrhea, adopting an animal experiment using pediatric diarrhea sprinkles (including *Euodia rutaecarpa*, *Fructus Piperis*, *Syzygium aromaticum*, and Cinnamon) recorded in the "Chinese Pharmacopoeia". Results from metabolic profiling studies demonstrated the therapeutic effect of the sprinkle in treating diarrhea in rats and elucidated its mechanism of action [7,8].

Table 1: Authors with ≥ 3 published research papers on traditional Chinese medicine for the treatment of pediatric diarrhea

Author	Number of published papers (articles)	Author	Number of published papers (articles)
Liu Li	7	Han Xuanming	3
Liu Qiang	6	Liu Huimin	3
Yang Yan	4	Yang Xiaoyan	3
Chen Siwei	3	Fang Hesong	3
Zhao Qiong	3	Yang Lei	3

As shown in Figure 3, it is visually evident that there are 5 relatively large nodes, namely Liu Li, Liu Qiang, Yang Yan, Yang Lei, and Liu Huimin. According to the statistical analysis combined with the application of Price's Law, it is calculated that $N=0.749\sqrt{X_{max}}$, where $X_{max}=7$, resulting in $N=1.981\approx 2$. This indicates that authors with a publication count ≥ 2 are considered high producers. In this study, there are a total of 78 high-producer authors, accounting for approximately 10% of the total number of authors. They have published a total of 174 papers, representing around 27% of the included literature. According to Price's Law, core authors should contribute to 50% of all papers in the field. Therefore, it can be inferred that the research literature on TCM treatment of pediatric diarrhea falls significantly short of the publication count specified by Price's Law, and the high production authors' research does not play a leading role in the content studied in this paper, nor has it formed a core author group. Additionally, Figure 3 also depicts some small collaborative teams, but the connections between the nodes are minimal, limited to only two authors, indicating weak collaboration. Furthermore, there are also a number of independent researchers. However, from the node colors, it can be observed that the small collaborative team led by Liang Zhen and Weiren Yao conducted early research on TCM for pediatric diarrhea, while the collaborative team represented by Liu Li and Liu Qiang represents emerging forces in the field.



Figure 3: Co-occurrence and collaboration network of authors

3.3. Publishing Journal

The literature sources for the treatment of pediatric diarrhea with traditional Chinese medicine, with a publication count of ≥ 10 , are listed in Table 2. The top-ranked journal is "Shaanxi Journal of Traditional Chinese Medicine" (70 articles). "Journal of Sichuan of Traditional Chinese Medicine" and "Journal of New Chinese Medicine" are tied for second place (both with 49 articles). The average impact factor of the 14 publications is 2.182, with considerable fluctuation. The highest impact factor is 4.487, while the lowest is 0.942.

Table 2: Journals with a publication count of ≥ 10 for traditional Chinese medicine treatment of pediatric diarrhea

No.	Chinese journal name	Number of publications/articles	IF
1	Shaanxi Journal of Traditional Chinese Medicine	70	2.405
2	Journal of Sichuan of Traditional Chinese Medicine	49	1.286
3	Journal of New Chinese Medicine	49	0.942
4	Chinese Journal of Integrated Traditional and Western Medicine	27	2.683
5	Chinese Acupuncture & Moxibustion	27	3.185
6	Liaoning Journal of Traditional Chinese Medicine	26	2.004
7	Shandong Journal of Traditional Chinese Medicine	25	1.566
8	Journal of Traditional Chinese Medicine	20	4.487
9	Hebei Journal of Traditional Chinese Medicine	20	1.642
10	Modern Journal of Integrated Traditional Chinese and Western Medicine	19	1.683
11	Henan Traditional Chinese Medicine	18	1.401
12	Journal of Emergency in Traditional Chinese Medicine	14	1.790
13	Lishizhen Medicine and Materia Medica Research	13	1.462
14	Chinese Journal of Experimental Traditional Medical Formulae	11	4.023

3.4. Author institution distribution and collaboration network analysis

The co-occurrence network of institutions can reflect the influential academic units and institutions within the research field, as well as the collaboration and collaboration strength between academic

institutions. The nodes involved in Figure 4 are a total of 622, with 204 connections, and a network density of 0.0011. As shown in Table 3, the College of TCM, Southern Medical University has the highest publication count (6 articles), followed by The First Affiliated Hospital of Henan College of TCM (5 articles) and Peking Children's Hospital Affiliated to Capital University of Medical Sciences (4 articles). Among the institutions located in the Guangzhou area, there are a total of 40 units, including the College of TCM, Southern Medical University, Basic Medical College of Guangzhou University of TCM, The First Affiliated Hospital of Guangzhou University of TCM, Guangzhou Hospital of Guangzhou Hospital of Traditional Chinese Medicine, Guangdong Provincial Hospital of TCM Pediatrics, accounting for about 6.4%, with a cumulative number of 50 published articles, accounting for about 7.7% of the total publication count. In Henan region, the main institutions are represented by Henan University of TCM and its affiliated hospitals, with a total of 36 units, accounting for about 5.8%. They have published a cumulative total of 45 articles, accounting for about 6.9% of the total publication count. Additionally, Beijing region, represented by Peking Children's Hospital Affiliated to Capital University of Medical Sciences, also has a considerable number of publications. There are also relatively more research papers published in regions such as Hebei, Jiangsu, Zhejiang, and Shandong [9, 10].

Table 3: Institutions with a publication count of ≥ 3 articles on the treatment of pediatric diarrhea with traditional Chinese medicine

No.	Number of published papers	Year	Institution
1	6	2013	College of TCM, Southern Medical University
2	5	2002	The First Affiliated Hospital of Henan College of TCM
3	4	2005	Peking Children's Hospital Affiliated to Capital University of Medical Sciences
4	3	2021	Pharmaceutical Research and Evaluation Technology Center of China Association of TCM
5	3	2012	Graduate School of Tianjin University of TCM
6	3	1996	Shandong University of TCM
7	3	2010	ChengDu University of TCM
8	3	1996	Jiangsu Province Hospital of Chinese Medicine
9	3	2011	Leting County Hospital, Tangshan City, Hebei Province
10	3	2009	Yutian County Hospital of TCM, Hebei Province
11	3	1992	Henan College of TCM

Based on the above data and Figure 4, it is not difficult to observe that although the publication count of institutions in a particular region is relatively high, the collaboration strength among the units within the same region is weak. It is mainly dominated by three research teams, namely Guangdong Provincial TCM Hospital and The First Affiliated Hospital of Hunan University of TCM, Nanyang Hospital of TCM, Henan Province, and Pharmaceutical Research and Evaluation Technology Center of China Association of TCM. These three teams have close internal collaboration and also collaborate with each other.

frequency keywords have high centrality, so high-frequency keywords cannot directly and accurately reflect research hotspots and trends. In CiteSpace software, centrality >0.1 can be regarded as a turning point in the development and research of a field, which to some extent indicates research hotspots in the field. In terms of the centrality of high-frequency keywords, "Massage" (Centrality = $0.22 > 0.1$) and "Umbilical therapy" (Centrality = $0.14 > 0.1$) are the key nodes in the map, and play a foundational and supportive role in stabilizing the research network in this field.

Table 4: High-frequency keywords in traditional Chinese medicine treatment of pediatric diarrhea (frequency ≥ 9 times)

No.	Frequency	Centrality	Year	Keywords
1	51	0.22	1992	Massage
2	25	0.14	1992	Umbilical application
3	19	0.05	2000	Autumn diarrhea
4	15	0.06	1992	Acupuncture treatment
5	14	0.08	1999	Smecta
6	9	0.08	1992	Shenque acpoint(RN8)
7	9	0.02	2003	Enema

3.6. Keyword clustering network analysis

Cluster network analysis is based on the similarity of keywords to cluster keywords with obvious co-occurrence relationships into one category, in order to more accurately reflect the focus of research frontiers. This helps minimize the differences between data within the same category and, conversely, maximize the differences [11]. In Citespace, the K-means clustering algorithm is used to quickly cluster keywords, and then analyzed using the Loglikelihood ratio (LLR) algorithm to obtain Figure 6. The Modularity (Q value) and Mean Silhouette (S value) of the clustering graph module are evaluation criteria for the effectiveness of the graph representation. They are used to measure the average homogeneity of the entire network. A score closer to 1 indicates higher homogeneity. When $Q > 0.3$, the clustering results are significant, and when $S > 0.7$, the clustering results are reliable. In Figure 6, $Q=0.8745 > 0.3$ and $S=0.9607 > 0.7$, indicating that the clustering structure is significant and the results are valid and reliable [7]. There are 10 clustered modules in the graph, represented by #0-#10, which are respectively #0 Diarrhea, #1 Children, #2 Massage, #3 Acupoints, #4 Fennel, #5 Spleen deficiency, #6 Dampness-heat, #7 Shenque acupoint(RN8), #8 Umbilical therapy, #9 Diarrhea of indigestion, #10 Antidiarrheal decoction. The smaller the cluster number, the larger the number of literature, impact, and scale within that cluster. Conversely, a larger number indicates smaller quantities. There are 510 nodes in total, with 590 connections between the nodes. The largest connection component includes a total of 274 nodes, accounting for 53 % of the network. Among them, # 0 Diarrhea and # 1 Children are the main subjects of this study. In addition to Traditional Chinese Medicine and integrated Chinese-Western medicine treatments for acute and chronic diarrhea in children, the research also includes transdermal drug delivery. #3 Acupoints, #4 Fennel, #8 Umbilical therapy, and #7 Shenque acupoint (RN8) can be classified together. The research in this category mainly explores the external application of common Chinese herbal medicines such as Fennel powder and Yam powder, as well as acupuncture points such as Four slit acupoints (EX-UE10) and Zusanli acupoint (ST36). Simultaneously, research was conducted on the application of traditional Chinese medicine as a new therapeutic approach, including external application of Chinese medicine on the umbilicus (Shenque acupoint), abdominal acupuncture, and Chinese herbal enema. #2 Massage and #5 Spleen deficiency can be classified together. The earliest research in this category appeared in 2003, and the main focus is on the clinical effectiveness of massage therapy for acute and

chronic diarrhea in children, as well as its role and effects in improving the constitution and immunity of children with diarrhea caused by spleen and stomach weakness. #6 Dampness-heat and #9 Diarrhea of indigestion mainly include the experiences of experts on diarrhea caused by different pathologies, as well as the efficacy of montmorillonite powder in treating diarrhea. #10 Antidiarrheal decoction appeared earlier, and its main research direction is the clinical efficacy of dampness-resolving drugs in treating damp-heat diarrhea.

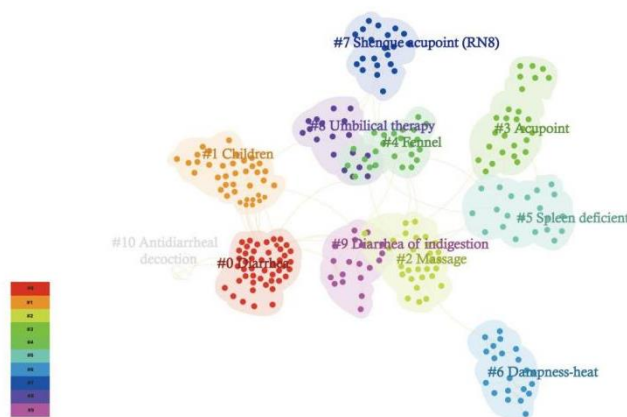


Figure 6: Clustered Keyword Map of Traditional Chinese Medicine Treatment for pediatric diarrhea

3.7. Analysis of Keyword Highlighting Map

Keyword highlighting can uncover keywords with significant frequency fluctuations, which can be used to explore cutting-edge content in the research field. In the graph, ‘Strength’ represents the intensity of highlighting, ‘Begin’ represents the initial year of highlighting, and ‘End’ represents the corresponding year when the highlighting ends. The top 15 keywords with the strongest citation bursts, obtained through analysis using Citespace software, are shown in Figure 7.

The main characteristics of research during the period 1992-2000 include: (1) Clinical efficacy evaluation of applying traditional Chinese medicine syndrome differentiation and compatibility in the form of umbilical therapy. (2) Clinical study on the treatment of pediatric diarrhea using electrical-magnetic machine technology combined with herbal powder applied to the navel acupoint. (3) A study on the traditional Chinese medicine syndrome differentiation of pediatric diarrhea and epidemiological investigation. (4) The main researched drugs include Yam, Clove, Scutellaria, Fennel, Cinnamon, Atractylodes, Plantain, Cablin potchouli herb, Cablin potchouli herb, Evodia rutaecarpa among others. (5) A randomized controlled experimental study on the therapeutic effects of applying herbal patches on the navel or combining acupuncture with pediatric massage therapy, as well as research on the preventive effects of pediatric massage therapy on diarrhea. (6) A comparative study of the clinical treatment effects of self-prescribed traditional Chinese medicine formulas and Western medicine (such as scopolamine, probiotic lactobacilli triple therapy tablets, etc.), as well as a randomized controlled experimental study on pediatric massage therapy compared with montmorillonite powder.

The main research characteristics from 2000 to 2022 include: (1) The methodological quality and reporting quality of randomized controlled trials on the efficacy of massage therapy for pediatric diarrhea. (2) A comparative study of rectal drip therapy in traditional Chinese medicine and Western medicine, including the pharmacology, mechanism of action, and clinical efficacy of Chinese medicine. (3) The therapeutic effects of traditional Chinese medicine on acute and persistent diarrhea, as well as its impact on serum levels of IL-6, IL-10, TNF- α , and the immune system.

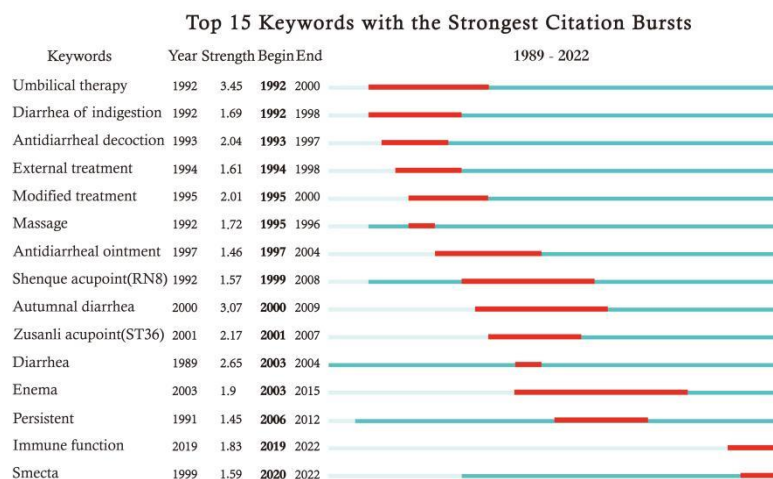


Figure 7: Concept map highlighting key keywords in the treatment of pediatric diarrhea with traditional Chinese medicine

4. Result analysis

Visual analysis of the literature included in this study can provide an intuitive representation of the development and trends in a particular research field using Citespace software [10].

4.1. Research hotspot analysis

4.1.1. Clinical efficacy study of traditional Chinese medicine compound in the treatment of pediatric diarrhea

The treatment of pediatric diarrhea with traditional Chinese medicine mainly relies on classical formulas and experienced physician-prescribed formulas, especially in the past 20 years. In a comparative study between Huangqin Tang (Scutellaria Decoction) and Montmorillonite Powder combined with Bifidobacterium lactis triple live bacteria tablets, the total effective rate of Huangqin Tang reached 97.83%, and it effectively reduced the levels of serum inflammatory factors (IL-6, IL-10, and TNF- α) and improved immune function indicators (CD4/CD8 ratio, IgA, IgG) [11]. In a comparative study between single use of Montmorillonite Powder and the combination of Shenling Baizhu Powder and Montmorillonite Powder in the treatment of pediatric diarrhea, the total effective rate of the combination therapy was 91.22%. It not only provided faster relief of clinical symptoms but also accelerated the recovery of gastrointestinal function [12]. In the comparative studies between self-formulated prescriptions such as Ge Gen Gu Lian Tang, Cang Ling Tang, compound Che Qian Jian Pi Li Shi San, and Che Ge Qin Lian Tang with drugs like Montmorillonite Powder and antibiotics, these self-formulated prescriptions have shown significant advantages over Western medicine in improving clinical symptoms, reducing serum inflammatory factor levels, and restoring gastrointestinal function [13-16]. The commonly used Chinese herbs in the treatment include Tuckahoe, Tangerine peel, Hawthorn fruit, Malt, Betel nut, Yam, Largehead atractylodes rhizome, and others. These herbs mainly have the effects of tonifying the spleen, stopping diarrhea, promoting digestion, clearing heat, and harmonizing the stomach [17].

4.1.2. Effectiveness study of external treatment of traditional Chinese medicine in the treatment of pediatric diarrhea

Due to the special characteristics of the target population, the application of traditional Chinese

medicine patches has gained more popularity in the treatment. External application of gel patches for pediatric diarrhea (Composed of Clove, Cinnamon, Evodia rutaecarpa and Pepper) can improve the function of intestinal villi in rats, reduce excitatory neurotransmitters, and increase inhibitory neurotransmitters, thereby achieving the effect of stopping diarrhea [18]. Application of traditional Chinese medicine external application on the Shenque acupoint (RN8) (Dampness-heat prescriptions :Chinese gall, Chinese goldthread rhizome;Cold diarrhea prescriptions:Chinese gall, Atractylodes;Diarrhea of indigestion prescriptions:Chinese gall, Hawthorn fruit) and basic treatment compared with placebo on the Shenque acupoint (RN8) and basic treatment: the traditional Chinese medicine external application group showed significant clinical efficacy in treating diarrhea, significantly shortened the duration of diarrhea in children, reduced the frequency of defecation, and improved the quality of life of children with diarrhea [19]. The comparison between using traditional Chinese medicine application (Clove 20g, Evodia rutaecarpa 20g, Largehead atractylodes rhizome 10g, Chinese gall 10g)on the navel and Western medicine showed that the traditional Chinese medicine group had significantly better treatment outcomes compared to the Western medicine group, indicating a better prognosis [20]. He [21] used pediatric anti-diarrhea patches for the treatment of pediatric diarrhea and Huang [22] used Tongxie Anpi Decoction and Changwei San patches for the treatment of diarrhea-predominant irritable bowel syndrome, those have shown significant therapeutic effects.

The combined application of traditional Chinese external treatment methods has been a research hotspot in the past 20 years. Comparisons have been made between the combination of massage and acupuncture at specific acupoints (Tianshu acupoint (ST25), Guanyuan acupoint (RN4), Zusanli acupoint (ST36), Four slit acupoints(EX-UE10)ect.) and the use of Western medicine alone for the treatment of chronic diarrhea. Other comparisons include the combination of massage and traditional Chinese medicine formulas for improving the immune function of children with diarrhea, acupressure combined with acupuncture for the treatment of rotavirus infection-related diarrhea, and the combination of navel therapy and moxibustion for the treatment of acute and chronic diarrhea in children of different age groups (including Shenque acupoint (RN8), Zhongwan acupoint (RN12), Tianshu acupoint (ST25), Guanyuan acupoint (RN4), Zusanli acupoint (ST36), Pishu acupoint (BL20), Shenshu acupoint (BL23), Dachangshu acupoint (BL25). These methods have shown better results in terms of relieving diarrhea symptoms, reducing the number of bowel movements, and improving immunity compared to Western medicine [23-29].

4.2. Trend analysis of research

4.2.1. Outlook on the Development Trends of Authors and Institutions

Researcher Liu Li, Liu Qiang, and others have conducted a study on the metabolic omics of traditional Chinese medicine patches for the treatment of diarrhea, providing new ideas for other researchers in this field in clinical treatment and experimental research, and providing a reference for clinical frontline workers and researchers in this field to find potential collaborators [30]. An analysis of the co-occurrence network of author affiliations reveals the existence of three major collaborative teams. They are respectively led by the Guangdong Provincial Hospital of Traditional Chinese Medicine and the First Affiliated Hospital of Hunan University of Traditional Chinese Medicine, the Nanyang City Hospital of Traditional Chinese Medicine in Henan Province, and the Drug Research and Evaluation Technology Center of a significant association in China. There is cross-provincial collaboration within all three teams, indicating a good level of nationwide research collaboration in the progress of pediatric diarrhea research in traditional Chinese medicine. This also provides the possibility of collaboration with institutions outside their respective provinces for future researchers in this field and offers new approaches to the TCM treatment of diarrhea in children from different

regions. In terms of published journals, "Shaanxi Journal of Traditional Chinese Medicine," "Journal of Sichuan of Traditional Chinese Medicine," and "Journal of New Chinese Medicine" have a considerable impact. This provides scholars with references for accessing literature sources and selecting target journals for paper publication.

4.2.2. Study on the Combined Therapeutic Effects of Pediatric massage, Traditional Chinese Medicine Patches, and Acupuncture

By analyzing the keyword network, it can be seen that pediatric massage therapy and abdominal patch therapy are consistently present in the research on traditional Chinese external therapy for treating pediatric diarrhea. Pediatric massage effectively compensates for poor compliance with infusion and medication, enhances spleen and stomach digestion and metabolism, restores spleen and stomach function, promotes gastric acid and digestive enzyme secretion, and improves immunity [31]. Acupuncture treatment is relatively less frequent, which is related to the specific characteristics of the targeted population. However, both acupuncture and moxibustion have shown significant therapeutic effects in treating different types of diarrhea, reflecting the traditional Chinese medicine principles of 'preventing diseases before they occur' and 'treating diseases at an early stage' [32,33]. Therefore, acupuncture and moxibustion should be promoted in the treatment of pediatric diarrhea. Clinical physicians should pay attention to the research and practice of acupuncture techniques for children. In moxibustion, appropriate methods such as sparrow-pecking moxibustion and indirect moxibustion should be selected. Furthermore, conducting clinical experimental research on acupuncture, moxibustion, TCM massage techniques, acupoints, and herbal patches should be considered as new research directions and priorities. The combination of these three external therapies based on syndrome differentiation should be a trend in clinical efficacy research and interdisciplinary studies.

5. Summary

In summary, the core authors of this study, represented by Liu Li, Liu Qiang, and Yang Yan, conducted research in institutions such as Guangdong Provincial TCM Hospital, The First Affiliated Hospital of Hunan University of TCM, Nanyang Hospital of TCM in Henan Province, and Pharmaceutical Research and Evaluation Technology Center of China Association of TCM. The journals with greater impact where the study was published included Shaanxi Journal of Traditional Chinese Medicine, Journal of Sichuan of Traditional Chinese Medicine, and Journal of New Chinese Medicine. The top five keywords with the highest frequency were pediatric massage therapy, umbilical therapy, autumn diarrhea, acupuncture treatment, and smecta. Smecta (Diosmectite) was mainly used as a control group in clinical observations. The research hotspots in traditional Chinese medicine for the treatment of pediatric diarrhea include clinical efficacy observations comparing classical formulas and individually prescribed formulas with Western medicine, the impact of internal treatment and external treatment of Chinese medicine on serum inflammatory factors and immune function in children with diarrhea. Among them, the use of herbal patches, acupuncture, and pediatric massage therapy are important in the treatment and prevention of this condition. Cross-regional and multi-center joint research is the future research trend. Although the three major institutional teams have close internal connections and strong cross-regional collaboration, there is still a need to enhance multi-center and cross-regional clinical research on a larger scale, as well as research on literature studies, the medication principles of renowned experienced TCM practitioners, and data mining [34]. There are issues regarding the standardization, normalization, and innovation of traditional Chinese medicine treatment methods, particularly in pediatric massage therapy. There are multiple schools of thought, and the selection of acupuncture points and massage techniques can vary. There is a lack of

evidence-based guidance in this field [1].

References

- [1] Yang Bingbin, Guo Kai, Wang Hongjuan. Interpretation of Expert Consensus on the Prevention and Treatment of Infantile Diarrhea by Integrating Traditional Chinese and Western Medicine[J]. *World Chinese Medicine*, 2023, 18(16):2261-2264+2272.
- [2] Zhou Jiang. New progress in the treatment of pediatric diarrhea[J]. *Electronic Journal Of Clinical Medical Literature*. 2020, 7(01):197-198.
- [3] Wang Fei. Infantile diarrhea treatment of traditional Chinese medicine[J]. *Nei Mongol Journal of Traditional Chinese Medicine*. 2018, 37(01):90-92.
- [4] Xia Tianhang. Diagnosis and treatment progress of infantile diarrhea were reviewed[J]. *Electronic Journal Of Clinical Medical Literature*. 2017, 4(23):4552-4553.
- [5] Wu Junling. Big data and the feature of TCM informatics similarity[J]. *Journal of Shandong University of Traditional Chinese Medicine*. 2015, 39(5):406-407.
- [6] Chen Chaomei. CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature [J]. *Journal of the American Society for Information Science and Technology*, 2005, 57(3):359-377.
- [7] Chen Siwei, Chen Yuming, Liu Li, et al. Metabonomic Study on Urine of Diarrheal Rats Treated with Xiaoer Fuxie Waifu Powder Based on UPLC /Q-TOF-MS[J]. *Chinese Journal of Experimental Traditional Medical Formulae*, 2014, 20(21):127-131.
- [8] Liu Huimin, Liu Li, Liu Qiang. Effect of Xiaoer Fuxie Waifu powder on gastrointestinal dynamics[J]. *China Journal of Chinese Materia Medica*, 2013, 38(14):2399-2402.
- [9] Zhou Yi, Wang Daiming, Li Xiaoqian, et al. Visualization analysis of the study on chronic heart failure TCM syndromes based on CiteSpace[J]. *Lishizhen Medicine and Materia Medica Research*, 2023, 34(03):764-768.
- [10] Chen Yue. Principles and applications of Citespace analysis: a practical guide to Citespace [M]. 2014.
- [11] Li Meng, Guo Yanhui, Liu Kehong, et al. Scutellaria decoction in the treatment of infantile diarrhea syndrome curative effect and the serum IL - 6, IL - 10, the influence of TNF alpha level[J]. *Lishizhen Medicine and Materia Medica Research*. 2022, 33(05):1161-1163.
- [12] Chen Yangjun, Zheng Zong, Zheng Bo. Clinical Study on Shenling Baizhu Granules Combined with Smecta for Infantile Dyspepsia Diarrhea [J]. *Journal of New Chinese Medicine*, 2020, 52(14):106-108.
- [13] Guo Gailing, Wang Yuxia. Gegen Gulian decoction and montmorillonite powder in the treatment of infantile diarrhea and its effect on serum inflammatory factors [J]. *Shaanxi Journal of Traditional Chinese Medicine*, 2018, 39(11):1613-1616.
- [14] Xue Ming, Tian Xinfeng, Da Chunshui, et al. Effect of compound Cheqian Jianpi Lishi Zhixie powder combined with western medicine on children with autumn diarrhea [J]. *Shaanxi Journal of Traditional Chinese Medicine*, 2017, 38(08):1089-1090.
- [15] Weng Zelin, Jiang Wenwen, Yang Jinghua, et al. Clinical effect of modified Cangling decoction on 122 children with diarrhea [J]. *Chinese Journal of Control of Endemic Disases*. 2017, 32(03):341+343.
- [16] Xi Leiming, Jin Yu. Clinical efficacy observation of Chege Zhaling Tang in treating 60 cases of pediatric diarrhea [J]. *Chinese Journal of Basic Medicine in Traditional Chinese Medicine*, 2016, 22(10):1415-1416.
- [17] Wu Xue, Dai Zeqi, Xu Simin, et al. Scoping review of clinical evidence of Chinese patent medicines for digestive system diseases in children[J]. *China Journal of Chinese Materia Medica*, 2022, 47(15):4248-4255.
- [18] Liu Li, Liu Qiang, Zhang Lu, et al. Effect of Xiaoer Fuxie Waifu gel emplastrum on intestinal villi and main neurotransmitters in rats[J]. *Lishizhen Medicine and Materia Medica Research*, 2020, 31(09):2113-2115.
- [19] Ma Chunyan, Shen Jian, He Yixiao, et al. Multi-center Clinical Effect of Traditional Chinese Medicine Application on Acute Diarrhea in Children[J]. *Liaoning Journal of Traditional Chinese Medicine*, 2021, 48(12):161-164.
- [20] Guo Yunqi, Guo Yunlan. Clinical application of external therapy for chronic diarrhea in children[J]. *Journal of Applied Clinical Pediatrics*, 2000(01):59.
- [21] Huang Xiangliu. Tongxie Anpi decoction combined with Changwei powder in the treatment of 56 cases of diarrhea-predominant irritable bowel syndrome [J]. *Chinese Journal of Integrated Traditional and Western Medicine on Digestion*, 2014, 22(03):164-165+167.
- [22] He Guangjie. Pediatric antidiarrheal post treatment of infantile diarrhea, 180 cases of clinical observation[J]. *Guiding Journal of Traditional Chinese Medicine and Pharmacy*, 2013, 19(12):132-133.
- [23] Huang Shuli. Acupuncture Combined with Acupoint Application in the Treatment of Rotavirus Enteritis in Children [J]. *Henan Traditional Chinese Medicine*, 2021, 41(12):1903-1906.
- [24] Wang Xinmin. Clinical Curative Observation of Applying Acupuncture Combined with Massage Treatment on Clinical Efficacy, Symptoms and Signs and Intestinal Flora in the Treatment of Children with Diarrhea[J]. *Journal of*

- Sichuan of Traditional Chinese Medicine*, 2022, 40(05):189-192.
- [25] Liu Xiaozhong, Zeng Zhao. Umbilical therapy combined with moxibustion for autumn diarrhea in children[J]. *Chinese Acupuncture & Moxibustion*, 2019, 39(08):832-836+848.
- [26] Wang Junhua, Liu Lei, Sun Zihong, et al. Effect of Jianpi Zhixie Decoction Combined with Tuina on Infantile Diarrhea and Its Effect on Immune Function[J]. *Chinese Archives of Traditional Chinese Medicine*, 2019, 37(02):400-402.
- [27] Peng Rongyan, Wang Ruiting, Cheng Nuo, et al. Systematic Review and Grade Profile of Randomized Controlled Trials of Infantile Massage in Treating 12-Under Children with Protracted or Chronic Diarrhea[J]. *Journal of Traditional Chinese Medicine*, 2018, 59(20):1747-1752.
- [28] Liu Jun'e. Comparative Analysis on Clinical Curative Effects of Acupuncture Combined with Chinese Massage and Montmorillonite Powder in Treatment of Children with Acute Non-bacterial Diarrhea[J]. *Chinese Journal of Basic Medicine in Traditional Chinese Medicine*, 2018, 24(03):387-389.
- [29] Jiang Hao, Tan Yanquan. Massage therapy clinical observation on 186 cases of infantile autumn diarrhea[J]. *Shandong Journal of Traditional Chinese Medicine*, 2000(02):92-93.
- [30] Zou Huiqin, Zhen Xueyan, Yan Juntang, et al. CiteSpace knowledge map of research hotspots and frontiers of traditional Chinese medicine intervention in psoriasis in recent ten years[J]. *China Journal of Chinese Materia Medica*, 2023, 48(11):3110-3117.
- [31] Zhou Xiaojun. Clinical effect of warming acupuncture at Shu and mu points combined with four-step massage in the treatment of chronic infantile diarrhea[J]. *The Journal of Medical Theory and Practice*, 2022, 35(02):287-290.
- [32] Deng Guiyuan. Analysis of Clinical Curative Effect of Acupuncture Combined With Traditional Chinese Medicine in the Treatment of Infantile Diarrhea[J]. *China Continuing Medical Education*, 2021, 13(32):184-187.
- [33] Lu Ye, Li Chenyi, Guo Qianqian, et al. The research progress of acupuncture treatment of infantile diarrhea[J]. *Yunnan Journal of Traditional Chinese Medicine and Materia Medica*, 2017, 38(07):83-85.
- [34] Jing Ji, Li Yuxia, Zhang Xue, et al. Visual Analysis of TCM Treatment for Anorexia in Children Based on Citespace [J]. *Chinese Journal of Library and Information Science for Traditional Chinese Medicine*, 2023, 47(02):54-59.