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ABOUT COVER

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AIMS AND SCOPE

The primary aim of World Journal of Diabetes (WJD, World J Diabetes) is to provide scholars and readers from various fields of diabetes with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WID mainly publishes articles reporting research results and findings obtained in the field of diabetes and covering a wide range of topics including risk factors for diabetes, diabetes complications, experimental diabetes mellitus, type 1 diabetes mellitus, type 2 diabetes mellitus, gestational diabetes, diabetic angiopathies, diabetic cardiomyopathies, diabetic coma, diabetic ketoacidosis, diabetic nephropathies, diabetic neuropathies, Donohue syndrome, fetal macrosomia, and prediabetic state.

INDEXING/ABSTRACTING

The WID is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Current Contents/Clinical Medicine, Journal Citation Reports/Science Edition, PubMed, PubMed Central, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2022 Edition of Journal Citation Reports® cites the 2021 impact factor (IF) for WJD as 4.560; IF without journal self cites: 4.450; 5-year IF: 5.370; Journal Citation Indicator: 0.62; Ranking: 62 among 146 journals in endocrinology and metabolism; and Quartile category: Q2.

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META-ANALYSIS

Effectiveness and safety of traditional Chinese medicine decoction for diabetic gastroparesis: A network meta-analysis

Yu-Xin Zhang, Yan-Jiao Zhang, Run-Yu Miao, Xin-Yi Fang, Jia-Hua Wei, Yu Wei, Jia-Ran Lin, Jia-Xing Tian

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Abstract

BACKGROUND

Diabetic gastroparesis (DGP) is a prevalent complication of diabetes that impairs people's quality of life and places a significant financial burden on them. The gastrointestinal symptoms of DGP patients can be improved by several Traditional Chinese Medicine (TCM) decoctions that have been shown to be effective in treating the disease. There are still many unanswered questions regarding the identification of appropriate therapeutic agents for the treatment of DGP in clinical practice.

AIM

To analyze the efficacy of several TCM decoctions in the treatment of DGP using Bayesian network meta-analysis for reference.

METHODS

PubMed, EMBASE, Cochrane Library, Web of Science, China National Knowledge Infrastructure, The China Biology Medicine DVD, Wanfang, and CQVIP were searched from inception to September 17, 2022, to collect randomized controlled trials (RCTs) about TCM decoctions for DGP. Clinical effects and symptom scores were the primary outcomes. Additionally, we assessed motilin (MOT), somatostatin (SS), gastrin (GAS), gastric emptying rate, gastric emptying time, and adverse drug events as secondary outcomes.

RESULTS

A total of 67 eligible RCTs involving 4790 DGP patients and 7 TCM decoctions



were included. The results of network meta-analysis (NMA) and surface under the cumulative ranking curve showed that with western medicine (WM) as a common control, the Banxia Xiexin Decoction (BXXD) + WM was most effective in clinical effects and enhancing early satiety scores; the Simo decoction (SMD) + WM was most effective in improving nausea and vomiting scores and anorexia scores, bloating scores; the Chaishao Liujunzi Decoction (CSLJD) was most effective in MOT, the Zhishi Xiaopi Decoction (ZSXPD) was most effective in SS and upgrading emptying rate; the Jianpi Xiaozhi Decoction was most effective in GAS; the CSLJD + WM was most effective in improving gastric emptying time.

CONCLUSION

These NMA results suggest that the BXXD + WM and SMD + WM may be one of the potential optimal treatments. Due to various limitations, further large-sample, double-blind, multi-center randomized RCTs are needed.

Key Words: Diabetic gastroparesis; Traditional Chinese medicine decoction; Network meta-analysis; Effectiveness

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Core Tip: The gastrointestinal symptoms of diabetic gastroparesis (DGP) patients can be improved by several Traditional Chinese Medicine (TCM) decoctions that have been shown to be effective in treating the disease. The main objective of this study is to analyze the efficacy and safety of several TCM decoctions in the treatment of DGP using Bayesian network meta-analysis(NMA) to better guide clinical decision-making. A total of 67 eligible randomized controlled trials involving 4790 DGP patients and 7 TCM decoctions were included. These NMA results suggest that combined with qualified TCM decoctions, western medicine (WM) is more effective for DGP patients than WM alone.

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INTRODUCTION

Diabetic gastroparesis (DGP), a complication of diabetes mellitus, is used to describe the upper gastrointestinal (GI) manifestations of diabetes characterized by delayed gastric emptying without mechanical obstruction[1,2]. The International Diabetes Federation estimated that approximately 537 million adult people worldwide were living with diabetes in 2021[3], and DGP is becoming more common as diabetes prevalence increases[4]. In the Diabetes Control and Complications Trial study, delayed gastric emptying was usually associated with GI symptoms and measures of early and longterm hyperglycemia^[5]. Anorexia, early postprandial satiety, stomach distension, nausea, and vomiting are the main clinical signs of DGP[6-8]. Because symptoms of gastroparesis resemble those of other GI disorders, such as functional dyspepsia and ulcers, diagnostic delay or misdiagnosis of gastroparesis is common in the real world^[9]. Quality of life is significantly reduced in patients with DGP impairment, with up to 50% of patients have considerable anxiety or depressive symptoms [10,11]. In addition, studies have shown that the economic burden of gastroparesis remains high several years after diagnosis, and long-term treatment is required to effectively control of symptoms, and reduce the burden of the disease^[12]. As a result, there is increased interest in figuring out how to use contemporary medical procedures to further enhance the quality of life and long-term prognosis of DGP patients.

Patients with DGP are treated with conventional western medicine gastric motility medications such as domperidone, metoclopramide, and mosapride citrate all over the world[13-16]. Although these medications help reduce patients' GI discomfort and promote increased nutrient intake, they also have some negative side effects and are simple to relapse following drug discontinuation[17-19]. Some patients with DGP are also treated with alternative strategies (endoscopy, electrical stimulation, or surgery), but with greater financial burden[20-23]. Traditional Chinese medicine (TCM) has a history of more than 2000 years in the treatment of GI diseases, which is considered a complementary and alternative therapy for patients with DGP[24-27]. It is usually used to improve nausea and vomiting and



help relieve abdominal distension. The TCM method is noninvasive and inexpensive and appears to be effective and promising based on clinical practice and some preliminary evidence. A large number of studies have demonstrated the efficacy of TCM decoction in the treatment of DGP[28-31], however, due to the wide variety of drugs and the lack of randomized controlled trials(RCTs) comparing drugs, it is inconvenient for clinicians to choose drugs, the TCM decoctions with the greatest effectiveness against DGP in adults have not been found.

By combining direct and indirect evidence and evaluating therapies in terms of efficacy or safety, network meta-analysis (NMA) enables simultaneous analysis of multiple interventions within a single study [32-34]. To provide a reference for the clinical selection of appropriate drugs suitable for the treatment of DGP, this study reviewed recent randomized RCTs to compare the efficacy and safety of various TCM decoctions for treatment of DGP.

MATERIALS AND METHODS

To describe our findings, we adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for NMA and the PRISMA guidelines[35-38]. Additionally, our protocol is listed in PROSPERO (https://www.crd.york.ac.uk/PROSPERO/, identifier CRD-42022369187).

Search Strategy

PubMed, EMBASE, Cochrane Library, Web of Science, China National Knowledge Infrastructure, The China Biology Medicine DVD, Wanfang, and CQVIP were searched from inception to September 17, 2022, to collect randomized RCTs about TCM decoctions for DGP. Search terms were as follows: (Diabetic gastric OR Diabetic gastroparesis OR diabetic stomach paresis OR Diabetic gastropareses) AND (Traditional Chinese Medicine OR Chinese Traditional Medicine OR TCM OR Chinese herb) AND (Clinical Trial OR Intervention Study OR trial OR clinical study). The detailed search strategy was shown in Supplementary Tables 1-4. To find further eligible research, relevant references from the included papers were looked for. Language, year of publishing, and type of publication were not restricted.

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: (1) Participants: Adults (more than 18 years old) with clinically diagnosed DGP based on symptomatic assessment; (2) Interventions and Comparisons: Patients in the treatment arm who received the Chinese medicine decoction will be included. And the control group was given other prokinetic drugs or decoction; and (3) Outcomes: Primary outcomes: Clinical effects and symptom score (nausea and vomiting, anorexia, early satiety, bloating, and overall gastroparesis symptoms scores). Secondary outcomes: Motilin (MOT), somatostatin (SS), gastrin (GAS), gastric emptying time, emptying rate, and adverse drug event as secondary outcomes.

The exclusion criteria were as follows: (1) Non-RCTs, conference abstracts, case reports, guidelines, letters, animal experiments, and review articles; (2) Participants: Gastroparesis caused by any other causes will be excluded; (3) Interventions: Studies that involve the use of acupuncture or auric acupuncture are excluded; (4) Outcome: Data could not be obtained from the original authors due to incorrect data or incomplete outcome measures; and (5) Duplicate published articles.

Literature Screening and Data Extraction

Records from databases were managed and screened using EndNote. 20 software. Two researchers (Zhang YX and Zhang YJ) independently conducted a literature search and data extraction, and the analysis part was discussed and assisted by the third researcher (Fang XY). The qualified literature was extracted into a data extraction table. Data extraction items included title, first author, publication year, sample size, gender(Male/Female), mean age, course of dears, intervention, treatment time, and outcomes. We emailed the first or corresponding author to request further information when a research's data were missing or the study procedures were not clearly explained.

Quality Assessment

Two reviewers (Zhang YX and Zhang YJ) independently assessed the risk of bias of the included RCTs according to Cochrane Handbook for Systematic Reviews of Interventions[39,40]. Seven aspects of random sequence generation, allocation concealment, subject and personnel blinding, outcome assessment blinding, outcome data incompleteness, selective reporting, and other sources of bias were evaluated. The results of the risk of bias assessment included the low risk of bias, the high risk of bias, and the unclear risk of bias. The outcomes of this examination were categorised as having a "low risk," "high risk," or "unclear risk of bias." Any differences of opinion will be resolved through discussion or agreement with a third reviewer. Review Manager 5.4 will generate a graphical display of the risk of bias assessment.



Grading the Certainty of Evidence for Major Comparisons and Outcomes

We evaluated the quality of the evidence for systematic reviews and clinical guidelines using the Grading of Recommendations Assessment, Development, and Evaluation method [41]. This method was created to rate the overall certainty of a body of information, involving five crucial domains: Risk of bias, inconsistency, indirectness, imprecision, and other considerations. These domains included potential confounders that may weaken the relationship and lessen the magnitude of the observed effect, as well as the variables that would enhance the correlation (large effect size, dose-response gradient, and plausible confounding). Each domain was evaluated by two reviewers, and disagreements were settled through discussion. To increase transparency, we recorded every choice we made regarding the certainty of the evidence. GradePro was used to develop finding summary tables (https:/ /gradepro.org).

Statistical Analysis

The generation of this NMA, forest plot, survey of statistical heterogeneity, and l^2 statistics was performed using the gemtc and jags packages of R (version 4.2.1)[42]. Odds ratio or relative risk with 95% confidence limits were used to present dichotomous variables. Standardized mean difference for continuous variables were shown as 95% credible intervals. Possible heterogeneity was assessed using Chi-square and I² tests, statistically significant was defined as P < 0.05, and the data were compiled using the random-effects model.

To depict the links between different interventions, a network diagram of each outcome was created. To rank various interventions, the surface under the cumulative ranking curve (SUCRA) and a plot of rank probabilities were used[43-45]. To obtain an optimal intervention, a multi-dimensional efficacy analysis was conducted to combine the findings from numerous outcomes. STATA 15.0 was used to generate funnel plots to determine the effects of publication bias and small-sample studies. Supplementary Table 5 summarizes the algorithms and scripts used in the software to perform the statistical analysis.

RESULTS

Literature Screening Result

The databases yielded 4171 articles in response to our queries. The titles and abstracts of 1453 citations were checked after the deduplicate record was eliminated. The complete text of 279 screened citations was then subjected to a further eligibility analysis. 56 papers that satisfied the criteria after reading the entire text were added to the NMA. Figure 1 depicts the specifics of the literature screening procedure.

Basic Characteristics of Included Studies

All investigations were carried out between 2005 and 2022, and 4790 patients were included in our meta-analysis, including 2404 in the experimental group (EG) and 2386 in the control group (CG). The average age of participants ranged from 45.1 to 83.5 years. The treatment duration ranged from 0.5 to 3 mo. Among the included trials, 20 RCTs were conducted using Banxia Xiexin Decoction (BXXD), and 853 patients as the EG and 844 patients treated with western medicine (WM) as the CG. There were 11RCTs in which 486 patients in the EG were treated with Xiangsha Liujunzi Decoction (XSLJZD), 6RCTs in which 360 patients in the EG were treated with Simo decoction (SMD), 5RCTs in which 232 patients in the EG were treated with Zhishi Xiaopi Decoction (ZSXPD), and 5RCTs in which 198 patients in the EG were treated with Chaishao Liujunzi Decoction (CSLJD). There were 5RCTs with 243 patients in the EG treated with Chaiqin-Wendan Decoction (CQWD), and 4RCTs with 198 patients in the EG treated with Jianpi Xiaozhi Decoction (JPXZD). Table 1 displays the fundamental features of the RCTs included in the NMA[46-101].

Risk of Bias Assessment

The Cochrane risk of bias calculation was used to evaluate the bias risk of each included trial. According to the Cochrane Reviewers' Handbook, 28 studies used the random number table method for grouping, while the other studies did not specify their randomization procedure. None of the other papers addressed blinding, only one double-blind trial was rated as low risk[64], and none of the other studies mentioned blinding. There was no selective reporting data in any of the studies or other risks in these studies. However, other risks to the quality of the included studies were not mentioned. Figure 2 displays a summary of the bias risk present in the RCTs. Supplementary Table 6 summarizes certaintyof-evidence ratings.

Effect of traditional Chinese medicine decoctions on clinical effects

Fifty Three RCTs in total, encompassing seven different TCM decoctions and twelve different types of interventions, reported the clinical outcomes [WM vs BXXD (n = 10), WM vs BXXD + WM (n = 8), WM *vs* XSLJZD (*n* = 6), WM *vs* XSLJZD + WM (*n* = 5), WM *vs* SMD (*n* = 5), WM *vs* SMD + WM (*n* = 1), WM



Table 1	Table 1 Characteristics of the studies included in this network meta-analysis													
	Otaala	N	0	Sample	size		Mean age	(yr)	Course of di	sease(yr)	Intervention		Treatment time	0
	Study	Year	Country	EG	CG	- Gender(M/F)	EG	CG	EG	CG	EG	CG	_ (mo)	Outcome
1	Zhu and Mei [<mark>46</mark>]	2022	China	61	61	68/54	63.08	62.76	4.62 ± 1.08	4.35 ± 1.21	BXXD + WM	WM	1	ab
2	Zhang and Huo [<mark>47</mark>]	2021	China	63	62	72/53	61.25	60.25	0.3-7	0.5-6	BXXD + WM	WM	1	bcd
3	Tan[<mark>48</mark>]	2021	China	36	36	37/35	58.06	55.72	-	-	BXXD	WM	3	abcde
4	Zhang and Yang[<mark>49</mark>]	2020	China	42	42	47/37	56.18	57.21	3.01 ± 1.25	2.94 ± 1.37	BXXD	WM	1	a
5	Li et al[<mark>50</mark>]	2020	China	31	31	32/30	55.4	57.7	11.7 ± 1.6	10.9 ± 3.9	BXXD + WM	WM	3	abf
6	Gao[<mark>51</mark>]	2020	China	40	40	42/38	57.04	56.96	4.65 ± 1.38	4.39 ± 1.64	BXXD + WM	WM	1	af
7	Wang[<mark>52</mark>]	2019	China	40	40	47/33	58.5	59.9	-	-	BXXD	WM	1	acf
8	Fan[<mark>53</mark>]	2019	China	84	84	96/72	61.3	58.7	2.7 ± 0.6	2.9 ± 0.8	BXXD	WM	1	a
9	Zhou et al[54]	2018	China	35	35	41/29	45.99	45.92	3.68 ± 0.43	3.54 ± 0.36	BXXD	WM	1	abde
10	Wang et al[55]	2018	China	46	44	41/49	45.21	45.11	2.67 ± 0.77	2.62 ± 0.75	BXXD + WM	WM	1	abi
11	Liu[<mark>56</mark>]	2018	China	25	25	21/29	51.5	51.4	8.2 ± 1.4	8.1 ± 1.5	BXXD + WM	WM	1	af
12	Han et al[<mark>57</mark>]	2018	China	29	29	31/27	52.7	52.10	3.26 ± 1.83	3.04 ± 1.50	BXXD + WM	WM	1	a
13	Wang[58]	2016	China	44	43	53/34	48.1	47.6	-	-	BXXD + WM	WM	1	afi
14	Zhao and Zhang[<mark>59</mark>]	2014	China	30	30	30/30	51.49	48.6	3-14	0.3-14	BXXD + WM	WM	1	ade
15	Lu and Xu[60]	2014	China	30	31	32/29	54.16	53.79	-	-	BXXD	WM	0.5	cg
16	Zhang and Fu [<mark>61</mark>]	2013	China	38	38	39/37	58.4	59.7	2.6 ± 1.8	2.8 ± 1.7	BXXD	WM	1	ag
17	Li[<mark>62</mark>]	2013	China	22	20	23/19	54.2	56.9	1.13 ± 0.51	0.16-1.6	BXXD	WM	1	afi
18	Wang[<mark>63</mark>]	2011	China	30	26	33/23	54.5	53.8	6.3 ± 2.5	6.8 ± 3.6	BXXD	WM	1	ab
19	Zou and Pan [<mark>64</mark>]	2009	China	24	24	27/21	54	55.17	2.78 ± 2.18	3.12 ± 2.13	BXXD	WM	1	a
20	Zhou[65]	2005	China	43	43	39/47	53.01	51.13	10.10 ± 3.22	10.21 ± 2.71	BXXD	WM	1	a
21	Liang[66]	2022	China	30	30	34/26	56.23	57.33	9.12 ± 3.11	8.29 ± 2.69	XSLJZD + WM	WM	1	abc
22	Zhang et al[67]	2021	China	64	64	47/81	51.84	50.57	(8.93 ± 1.05)	(9.14 ± 1.24)	XSLJZD + WM	SBS + WM	1	bcdeg

									mo	mo				
23	Chen[68]	2018	China	40	40	46/34	67.94	68.1	-	-	XSLJZD	WM	1.5	а
24	Guo et al[<mark>69</mark>]	2017	China	24	24	30/18	54.36	56.85	(16.4 ± 0.6) d	(16.9 ± 0.7) d	XSLJZD	WM	2	af
25	Yu et al[<mark>70</mark>]	2016	China	35	35	38/22	57.86	56.4	-	-	XSLJZD + WM	WM	1	ab
26	Chen et al[71]	2016	China	78	78	61/95	50.31	52.41	1.29 ± 0.47	1.31 ± 0.22	XSLJZD	WM	1	afi
27	Fu et al[72]	2014	China	40	40	44/36	70.2	69.9	4.3 ± 1.3	4.6 ± 1.5	XSLJZD + WM	WM	1	ace
28	Wen[73]	2012	China	44	43	48/39	55.6	54	(14.8 ± 5.2) d	(15.3 ± 5.3) d	XSLJZD	WM	2	ai
29	Cai[74]	2011	China	27	27	29/25	60.23	59.35	-	-	XSLJZD + WM	WM	1	abi
30	Hou et al[75]	2010	China	56	56	87/25	49.0-84.0	48.5-83.5	0.66-2.42	0.58-2.25	XSLJZD	WM	2	abf
31	Lu[<mark>76</mark>]	2009	China	48	46	52/42	53.3	52.8	-	-	XSLJZD	WM	1	ab
32	Chu et al[77]	2017	China	50	50	46/54	65.7	66	(15 ± 4) mo	(16 ± 6) mo	SMD + WM	WM	1.5	abcdei
33	Wang[78]	2014	China	70	70	78/62	71.4	71.4	15.2	15.2	SMD	WM	1	а
34	Wang[79]	2011	China	22	22	27/17	46.1	46.1	5.3 ± 2.0	5.3 ± 2.0	SMD	WM	1.25	aci
35	Sun et al[80]	2007	China	51	50	-	56.7	55.6	6.1 ± 4.1	6.4 ± 3.6	SMD	WM	1	ai
36	Sun and Gao [<mark>81</mark>]	2007	China	21	20	20/21	48.3	49.4	-	-	SMD	WM	1	ai
37	Qiu and Liu[82]	2005	China	40	38	47/31	57.3	58	-	-	SMD	WM	1	abi
38	Liu and Cai[<mark>83</mark>]	2017	China	32	34	39/28	44.55	42.67	(15.61 ± 6.66) mo	(16.02 ± 7.12) mo	ZSXPD + WM	WM	1	af
39	Qiu et al[84]	2016	China	78	78	80/76	62.21	62.21	15.37 ± 7.25	15.37 ± 7.25	ZSXPD	WM	1	adg
40	Lu[<mark>85</mark>]	2012	China	59	59	65/53	56.42	54.63	6.81 ± 2.57	5.97 ± 2.75	ZSXPD	WM	1	acde
41	Zhao et al[<mark>86</mark>]	2010	China	33	30	28/35	63.2	61.9	16.30 ± 7.52	18.10 ± 7.9	ZSXPD	WM	1	abcdeg
42	Yang and Li[87]	2010	China	30	30	39/21	56.73	56.76	7.57 ± 2.48	7.85 ± 2.74	ZSXPD	WM	1	aig
43	Li[<mark>88</mark>]	2021	China	20	20	22/18	56.42	56.34	6.35 ± 1.29	6.23 ± 1.34	CSLJD + WM	WM	1	acfi
44	Wang and Hou [<mark>89]</mark>	2019	China	31	31	34/28	53.3	53.6	(4-16) mo	(6-18) mo	CSLJD	WM	1	acf
45	Jiao[90]	2019	China	57	57	59/55	57.52	56.97	(10.43 ± 2.15) mo	(10.37 ± 2.18) mo	CSLJD + WM	WM	0.75	cf
46	Jin[<mark>91</mark>]	2016	China	50	50	41/59	53.2	54.2	(4-16) mo	(5-17) mo	CSLJD	WM	0.75	acfi
47	Zou[<mark>92</mark>]	2009	China	40	38	35/43	61.15	60.89	(10.17 ± 4.53)	(9.97 ± 4.21)	CSLJD	WM	1	acfi

									mo	mo				
48	Lil <mark>[93</mark>]	2022	China	30	30	37/23	51.16	52.08	8.45 ± 2.16	8.13 ± 2.72	CQWD	WM	1	abcefi
49	Liu[94]	2021	China	49	49	51/47	53.42	52.83	5.16 ± 1.19	5.12 ± 1.25	CQWD	WM	1	abf
50	Hu[<mark>95</mark>]	2021	China	50	50	56/44	62.9	63.6	6.3 ± 1.3	6.5 ± 1.4	CQWD	WM	1	abcdg
51	Xu et al[<mark>96</mark>]	2020	China	69	69	75/63	51.24	51.24	0.83 ± 0.12	0.84 ± 0.13	CQWD	WM	1	abcefi
52	Yao <i>et al</i> [<mark>97</mark>]	2019	China	45	44	-	51.8	52.2	5.26 ± 0.75	4.81 ± 0.35	CQWD	WM	1	abg
53	Tian[<mark>98</mark>]	2017	China	48	48	63/33	52.5	53.2	-	-	JPXZD	WM	1	abcef
54	Li[<mark>99</mark>]	2017	China	47	47	35/59	56.2	51.2	8.27 ± 1.48	9.17 ± 2.74	JPXZD	WM	1	abcef
55	An and Wang [<mark>100</mark>]	2016	China	56	56	59/53	50.4	52.1			JPXZD	WM	1	acef
56	Lan and Yao [<mark>101</mark>]	2015	China	47	49	53/43	51.6	52.3	-	-	JPXZD	WM	1	abcef

WM: Western medicine; BXXD: Banxia Xiexin Decoction; XSLJZD: Xiangshaliujunzi Decoction; SMD: Simo decoction; ZSXPD: ZhiShiXiaoPi decoction; CSLJD: Chaishaoliujun Decoction; CQWD: Chaiqin-Wendan Decoction; JPXZD: Jianpi Xiaozhi Decoction. EG: Experimental group; CG: Control group; M: Male; F: Female; a: Clinical effects; b: Symptom scores (nausea and vomiting scores, anorexia scores, early satiety scores, bloating scores); c: Motilin; d: Somatostatin; e: Gastric emptying time; g: Emptying rate; h: Adverse drug event.

vs ZSXPD (n = 4), WM *vs* ZSXPD + WM (n = 1), WM *vs* CSLJD (n = 3), WM *vs* CSLJD + WM (n = 1), WM *vs* CQWD (n = 5), WM *vs* JPXZD (n = 4)] (Table 1). The network plot is presented in Figure 3A. Pairwise meta-analyses were conducted to compare TCM decotions with WM in clinical effects, and details are illustrated in Figure 3B. Apart from CSLJD + WM, XSLJZD, XSLJZD + WM, and ZSXPD, other TCM decotions were superior to WM alone. The specifics are displayed in Table 2.

Following is the ranking of 13 therapies based on SUCRA probability results (Figure 3C, Table 3): BXXD + WM (75.49%) > SMD + WM (68.1%) > ZSXPD + WM (65.12%) > CSLJD (64.56%) > ZSXPD (61.92%) > JPXZD (61.36%) > CQWD (57.35%) > XSLJZD + WM (56.77%) > BXXD (51.34%) > SMD (42.1%) > XSLJZD (22.32%) > CSLJD + WM (21.53%) > WM (2.03%). The intervention with the highest likelihood of improving clinical results was BXXD + WM.

Effect of traditional Chinese medicine decoctions on symptom scores

Nausea and vomiting scores: A total of 17 RCTs reported nausea and vomiting scores, including five types of TCM decoctions and eight types of interventions [WM *vs* BXXD (n = 2), WM *vs* BXXD + WM (n = 3), WM *vs* XSLJZD (n = 1), WM *vs* XSLJZD + WM (n = 2), WM *vs* SMD (n = 1), WM *vs* SMD + WM (n = 1), WM *vs* CQWD (n = 5), WM *vs* JPXZD (n = 2)] (Table 1). The network plot is presented in Figure 4A. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in nausea and vomiting scores, and details are illustrated in Figure 4B. The TCM decoctions were all superior to WM alone, as were the TCM decoctions mixed with WM. Additionally, there were statistically significant variations across various TCM decoctions, such as BXXD *vs* BXXD + WM, BXXD *vs* CQWD, BXXD *vs* JPXZD, BXXD *vs* SMD, BXXD *vs* SMD + WM, BXXD *vs* XSLJZD, BXXD + WM *vs* CQWD, BXXD + WM *vs*

Table 2 Odds ratio/weight mean difference (95% credible interval) results of the network meta-analysis

Clinical effects	BXXD	BXXD_WM	CQWD	CSLJD	CSLJD_WM	JPXZD	SMD
BXXD	1						
BXXD_WM	0.72 (0.36, 1.4)	1					
CQWD	0.93 (0.48, 1.76)	1.29 (0.61, 2.74)	1				
CSLJD	0.83 (0.36, 1.83)	1.16 (0.47, 2.77)	0.9 (0.37, 2.11)	1			
CSLJD_WM	2.21 (0.44, 10.19)	3.07 (0.58, 14.99)	2.38 (0.46, 11.51)	2.65 (0.48, 13.86)	1		
JPXZD	0.87 (0.38, 1.89)	1.21 (0.5, 2.91)	0.94 (0.39, 2.18)	1.05 (0.39, 2.81)	0.39 (0.08, 2.17)	1	
SMD	1.14 (0.57, 2.24)	1.58 (0.73, 3.46)	1.23 (0.57, 2.61)	1.37 (0.56, 3.42)	0.52 (0.11, 2.73)	1.3 (0.54, 3.23)	1
SMD_WM	0.72 (0.14, 2.73)	1 (0.19, 3.99)	0.77 (0.15, 3.07)	0.86 (0.15, 3.77)	0.32 (0.04, 2.5)	0.82 (0.15, 3.57)	0.63 (0.12, 2.56)
WM	3.93 (2.66, 5.91)	5.44 (3.25, 9.61)	4.23 (2.57, 7.18)	4.71 (2.4, 9.83)	1.79 (0.4, 8.59)	4.49 (2.33, 9.28)	3.44 (2, 6.13)
XSLJZD	1.57 (0.84, 2.9)	2.17 (1.07, 4.5)	1.68 (0.84, 3.41)	1.88 (0.82, 4.46)	0.71 (0.15, 3.64)	1.79 (0.79, 4.22)	1.37 (0.66, 2.87)
XSLJZD_WM	0.93 (0.44, 1.92)	1.3 (0.57, 2.94)	1.01 (0.45, 2.21)	1.12 (0.44, 2.88)	0.42 (0.08, 2.27)	1.07 (0.43, 2.72)	0.82 (0.36, 1.86)
ZSXPD	0.87 (0.4, 1.83)	1.2 (0.52, 2.79)	0.94 (0.4, 2.11)	1.04 (0.4, 2.71)	0.39 (0.08, 2.13)	1 (0.39, 2.58)	0.76 (0.32, 1.78)
Nausea and vomiting scores	BXXD	BXXD_WM	CQWD	JPXZD	SMD	SMD_WM	WM
BXXD	0						
BXXD_WM	0.65 (0.17, 2.5)	0					
CQWD	0.79 (0.23, 2.77)	1.22 (0.42, 3.65)	0				
JPXZD	0.61 (0.14, 2.69)	0.95 (0.25, 3.63)	0.78 (0.23, 2.62)	0			
SMD	0.41 (0.07, 2.43)	0.63 (0.12, 3.44)	0.52 (0.1, 2.52)	0.66 (0.11, 3.94)	0		
SMD_WM	2.93 (0.46, 18.72)	4.52 (0.78, 26.05)	3.71 (0.69, 19.4)	4.79 (0.75, 30.37)	7.18 (0.87, 60.2)	0	
WM	0.4 (0.14, 1.14)	0.61 (0.26, 1.45)	0.5 (0.26, 0.97)	0.65 (0.23, 1.82)	0.97 (0.23, 4.19)	0.14 (0.03, 0.63)	0
XSLJZD	0.47 (0.08, 2.84)	0.72 (0.13, 3.97)	0.59 (0.12, 2.92)	0.77 (0.13, 4.62)	1.15 (0.15, 9.16)	0.16 (0.02, 1.35)	1.18 (0.28, 5.13)
Anorexia scores	BXXD_WM	CQWD	SMD	SMD_WM	WM	XSLJZD	XSLJZD_WM
BXXD_WM	0						
CQWD	0.37 (0.07, 1.66)	0					
SMD	0.19 (0.02, 1.62)	0.52 (0.06, 4.56)	0				



SMD_WM	2.08 (0.22, 18.36)	5.67 (0.62, 50.9)	10.86 (0.76, 158.85)	0			
WM	0.19 (0.06, 0.55)	0.52 (0.17, 1.53)	0.99 (0.15, 6.46)	0.09 (0.01, 0.62)	0		
XSLJZD	0.25 (0.03, 2.07)	0.67 (0.08, 5.77)	1.29 (0.09, 18.09)	0.12 (0.01, 1.69)	1.3 (0.2, 8.38)	0	
XSLJZD_WM	1.27 (0.13, 11.66)	3.47 (0.36, 32.67)	6.63 (0.43, 99.8)	0.61 (0.04, 9.45)	6.69 (0.93, 48.32)	5.14 (0.34, 77.76)	0
Early satiety scores	BXXD	BXXD_WM	CQWD	JPXZD	SMD	SMD_WM	WM
BXXD	0						
BXXD_WM	2.95 (0.77, 13.01)	0					
CQWD	1.88 (0.43, 8.37)	0.64 (0.19, 1.89)	0				
JPXZD	0.74 (0.18, 2.99)	0.25 (0.09, 0.65)	0.39 (0.13, 1.22)	0			
SMD	0.5 (0.09, 2.79)	0.17 (0.04, 0.68)	0.27 (0.06, 1.23)	0.68 (0.17, 2.78)	0		
SMD_WM	2.67 (0.46, 15.44)	0.9 (0.19, 3.71)	1.42 (0.3, 6.7)	3.61 (0.84, 15.32)	5.32 (0.9, 31.54)	0	
WM	0.49 (0.15, 1.62)	0.16 (0.07, 0.32)	0.26 (0.11, 0.63)	0.66 (0.33, 1.33)	0.97 (0.28, 3.36)	0.18 (0.05, 0.65)	0
Bloating scores	BXXD	BXXD_WM	CQWD	JPXZD	SMD	SMD_WM	WM
BXXD	0						
BXXD_WM	1.1 (0.58, 2.21)	0					
CQWD	0.93 (0.49, 1.79)	0.85 (0.49, 1.42)	0				
JPXZD	0.65 (0.33, 1.29)	0.59 (0.32, 1.03)	0.7 (0.4, 1.2)	0			
SMD	0.45 (0.17, 1.16)	0.41 (0.17, 0.96)	0.48 (0.2, 1.12)	0.69 (0.29, 1.68)	0		
SMD_WM	2.66 (1, 7.13)	2.42 (0.95, 5.89)	2.86 (1.16, 6.92)	4.11 (1.63, 10.31)	5.92 (1.91, 18.3)	0	
WM	0.44 (0.26, 0.76)	0.4 (0.26, 0.58)	0.47 (0.33, 0.66)	0.68 (0.44, 1.04)	0.98 (0.45, 2.13)	0.17 (0.07, 0.38)	0
XSLJZD	0.56 (0.26, 1.18)	0.5 (0.25, 0.95)	0.6 (0.31, 1.11)	0.86 (0.43, 1.69)	1.23 (0.48, 3.16)	0.21 (0.08, 0.55)	1.26 (0.74, 2.13)
мот	BXXD	BXXD_WM	CQWD	CSLJD	CSLJD_WM	JPXZD	SMD
BXXD	0						
BXXD_WM	73145227955313819658 (16.53, 2.030196546848e + 38)	0					
CQWD	35423305.81 (0, 5.93544195488604e + 21)	0 (0, 1661.84)	0				
CSLJD	1.49786530431541e + 62 (3.50996919314233e + 43,	2.12100175311827e + 42 (7.96830853291658e + 22,	4.41194389881838e + 54 (1.64238728480315e + 39,	0			

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	5.47316977723933e + 80)	6.07610382119557e + 61)	1.56982913306051e + 70)				
CSLJD_WM	2.02292315583141e + 56 (2.13482601427363e + 38, 3.74341135713198e + 73)	3.39246479689985e + 36 (332081441777967616, 3.74853474640655e + 54)	6.5996363207526e + 48 (1.22057356959688e + 34, 6.1480125702437e + 62)	0 (0, 2732647433755.58)	0		
JPXZD	1.46545014434071e + 35 (1.63502079852166e + 21, 1.17286388222191e + 49)	2074599066114823 (1.29, 3.17467766771584e + 30)	3.84186585617681e + 27 (1237249559868129024, 2.96562509673173e + 37)	0 (0, 0)	0 (0, 0)	0	
SMD	4.20171429734073e + 26 (25898.14, 8.26692473710835e + 48)	6849152.53 (0, 9.10517874469878e + 29)	11853726740880627712 (0.26, 1.11780444531916e + 39)	0 (0, 0)	0 (0, 0)	0 (0, 116505229632.1)	0
SMD_WM	2.28758076383624e + 34 (3326609644123.49, 7.88309912633195e + 55)	281406176126933 (0, 7.9670020400884e + 36)	5.89642990959044e + 26 (39869414.39, 9.32616031295542e + 45)	0 (0, 0)	0 (0, 1.24)	0.14 (0, 954822479322721408)	39739999.76 (0, 2.14570758341921e + 33)
WM	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)
XSLJZD_WM	14666.56 (0, 16247355947961442304)	0 (0, 8.34)	0 (0, 158351284.3)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0.01)
ZSXPD	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)
SS	BXXD	BXXD_WM	CQWD	SMD_WM	WM	XSLJZD_WM	ZSXPD
BXXD	0						
BXXD_WM	0.01 (0, 36713863287.61)	0					
CQWD	240.28 (0, 462592820033121344)	18640.19 (0, 4.5779943358534e + 19)	0				
SMD_WM	0.11 (0, 224930986970319)	8.59 (0, 17667828742718418)	0 (0, 248861236102597)	0			
WM	53749.9 (0, 32864187823875.5)	4200830.54 (0.01, 3136485942463265)	224.17 (0, 839932932110503)	493063.5 (0, 1651805622636769024)	0		
XSLJZD_WM	50.96 (0, 102248837325752448)	3884.92 (0, 10556005822499647488)	0.2 (0, 117147511992865184)	472.76 (0, 2.04812782178715e + 20)	0 (0, 3009685068.16)	0	
ZSXPD	0 (0, 0.04)	0 (0, 3.92)	0 (0, 0.14)	0 (0, 224.03)	0 (0, 0)	0 (0, 0.5)	0
GAS	BXXD	BXXD_WM	CQWD	JPXZD	SMD_WM	WM	XSLJZD_WM
BXXD	0						
BXXD_WM	28048.32 (0, 24195406220047416)	0					
CQWD	0 (0, 69857.01)	0 (0, 1321.29)	0				
JPXZD	22986750.89 (0.07, 3480782610051639)	822.3 (0, 114613769790857)	582462249573.32 (4165.62, 86824668158199087104)	0			

SMD_WM	772.69 (0, 202805460193874)	0.03 (0, 1605419615413.43)	19391679.88 (0, 6739519315925827584)	0 (0, 1354996.37)	0		
WM	0 (0, 0)	0 (0, 0)	0 (0, 7.5)	0 (0, 0)	0 (0, 0)	0	
XSLJZD_WM	14792825.45 (0, 3.68830686229498e + 20)	543.92 (0, 1313792551296612864)	397907647799.45 (0.02, 1.01862834805861e + 25)	0.66 (0, 3321105849542.14)	20391.36 (0, 22295919254655209472)	205575165013649344 (528058.51, 1.00959763024414e + 29)	0
ZSXPD	0 (0, 532.37)	0 (0, 7.77)	0 (0, 14795237.56)	0 (0, 0)	0 (0, 116.31)	2297.17 (0, 22820407856.58)	0 (0, 0.32)
Gastric emptying time	BXXD	BXXD_WM	CQWD	CSLJD	CSLJD_WM	JPXZD	SMD_WM
BXXD	0						
BXXD_WM	3.31 (1.45, 7.77)	0					
CQWD	5.57 (2.29, 13.92)	1.68 (0.79, 3.6)	0				
CSLJD	12.15 (4.95, 29.89)	3.66 (1.69, 7.79)	2.18 (0.94, 4.96)	0			
CSLJD_WM	12.34 (4.61, 33.56)	3.73 (1.56, 8.86)	2.21 (0.87, 5.6)	1.02 (0.4, 2.59)	0		
JPXZD	0.9 (0.39, 2.11)	0.27 (0.14, 0.54)	0.16 (0.08, 0.34)	0.07 (0.03, 0.16)	0.07 (0.03, 0.17)	0	
SMD_WM	0.99 (0.31, 3.2)	0.3 (0.1, 0.86)	0.18 (0.06, 0.54)	0.08 (0.03, 0.25)	0.08 (0.02, 0.26)	1.11 (0.38, 3.17)	0
WM	0.78 (0.4, 1.56)	0.24 (0.14, 0.38)	0.14 (0.08, 0.25)	0.06 (0.04, 0.12)	0.06 (0.03, 0.13)	0.87 (0.53, 1.41)	0.79 (0.31, 2.02)
XSLJZD	1.52 (0.62, 3.89)	0.46 (0.21, 1.01)	0.27 (0.12, 0.64)	0.13 (0.05, 0.3)	0.12 (0.05, 0.32)	1.69 (0.78, 3.74)	1.53 (0.5, 4.78)
Emptying rate	BXXD	CQWD	SMD_WM	WM	XSLJZD_WM		
BXXD	0						
CQWD	69.8 (0.15, 32653.33)	0					
SMD_WM	0.25 (0, 358.08)	0 (0, 3.64)	0				
WM	845.68 (7.55, 83742.05)	11.9 (0.2, 662.69)	3299.5 (11.8, 939381.79)	0			
XSLJZD_WM	0.04 (0, 69.4)	0 (0, 0.68)	0.14 (0, 547.9)	0 (0, 0.02)	0		
Adverse drug event	BXXD	BXXD_WM	CQWD	CSLJD	CSLJD_WM	SMD	SMD_WM
BXXD	1						
BXXD_WM	52414822144496.4 (5.15, 4.030355125387e + 40)	1					
CQWD	523486623214299 (44.52, 4.99143462215951e + 41)	9.46 (0.22, 820)	1				

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CSLJD	2.1013167745814e + 21 (68867.54, 6.94805069595938e + 49)	5570723.63 (10.18, 65917394402402795520)	546167.92 (0.79, 6291215618954215424)	1			
CSLJD_WM	903925158662983 (64.85, 7.24389664845627e + 41)	16.04 (0.14, 2989.89)	1.66 (0.01, 331.36)	0 (0, 3.21)	1		
SMD	87868125051078.8 (8.79, 6.46520330928223e + 40)	1.58 (0.07, 46.22)	0.17 (0, 5.2)	0 (0, 0.14)	0.1 (0, 9.11)	1	
SMD_WM	92995980732601.7 (6.45, 7.01779753944577e + 40)	1.68 (0.02, 180.95)	0.18 (0, 19.11)	0 (0, 0.26)	0.1 (0, 26.32)	1.05 (0.01, 72.95)	1
WM	54754719159198.7 (6.18, 4.32688099919118e + 40)	1.01 (0.07, 14.35)	0.11 (0, 1.76)	0 (0, 0.07)	0.06 (0, 3.34)	0.64 (0.08, 4.09)	0.6 (0.01, 27.12)
XSLJZD	138602669761684 (13.39, 1.24283951732813e + 41)	2.63 (0.06, 124.69)	0.28 (0, 13.6)	0 (0, 0.28)	0.17 (0, 20.87)	1.65 (0.06, 46.29)	1.56 (0.01, 176)
XSLJZD_WM	2.292622716453e + 27 (1041432.11, 2.95058492834921e + 63)	681629044495.03 (13.68, 1.1410582712159e + 37)	63891194824.14 (1.24, 1.1687385549262e + 36)	69412.73 (0, 1.68323760596052e + 30)	40072042129.9 (0.6, 8.14243889280231e + 35)	419783352848.06 (9.15, 6.85444195823832e + 36)	419971257349.63 (6.35, 7.28909075697952e + 36)
ZSXPD	1.33392510385293e + 29 (3556788.54, 2.79172392054822e + 64)	25171485790455 (76.21, 3.26348786128855e + 38)	2361108310720.74 (6.5, 3.27810997427274e + 37)	1039292.85 (0, 8.27654798676685e + 30)	1488785454440.43 (3.09, 2.01068712178454e + 37)	15678668377271.4 (48.99, 1.96838317351027e + 38)	14704293429199.2 (32.62, 2.04193370876875e + 38)

MOT: Motilin; SS: Somatostatin; GAS: Gastrin; WM Western medicine; WM: Western medicine; BXXD: Banxia Xiexin Decoction; XSLJZD: Xiangshaliujunzi Decoction; SMD: Simo decoction; ZSXPD: ZhiShiXiaoPi decoction; CSLJD: Chaishaoliujun Decoction; CQWD: Chaiqin-Wendan Decoction; JPXZD: Jianpi Xiaozhi Decoction.

JPXZD, BXXD + WM vs SMD, BXXD + WM vs SMD + WM, BXXD + WM vs XSLJZD, CQWD vs JPXZD, CQWD vs SMD, CQWD vs SMD + WM, CQWD vs XSLJZD, JPXZD vs SMD, JPXZD vs SMD + WM, SMD vs XSLJZD, and SMD + WM vs XSLJZD. Table 2 displays the information.

SMD + WM was most likely the best intervention to raise nausea and vomiting scores, as demonstrated by SUCRA probability values (Figure 4C, Table 3). The ranking of thirteen interventions is as follows: SMD + WM (93.7%) > XSLJZD + WM (75.52%) > BXXD (66.51%) > CQWD (56.35%) > BXXD + WM (44.93%) > JPXZD (42.02%) > XSLJZD (30.55%) > SMD (24.71%) > WM (15.72%).

Anorexia scores: Ten RCTs in total, encompassing four different TCM decoctions and six different types of therapies, reported the anorexia scores [WM *vs* BXXD + WM (n = 3), WM *vs* XSLJZD (n = 1), WM *vs* XSLJZD + WM (n = 1), WM *vs* SMD (n = 1), WM *vs* SMD + WM (n = 3), WM *vs* CQWD (n = 3)] (Table 1). The network plot is presented in Figure 4D. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in anorexia scores, and details are illustrated in Figure 4E. Table 2 shows that SMD + WM, XSLJZD + WM, BXXD + WM, CQWD, XSLJZD, and SMD were greater to WM alone, where the difference was statistically significant. In addition, the differences between different interventions, such as BXXD + WM *vs* CQWD, BXXD + WM *vs* SMD, BXXD + WM *vs* SMD + WM, BXXD + WM *vs* XSLJZD, BXXD + WM *vs* XSLJZD + WM, CQWD *vs* SMD, CQWD *vs* SMD + WM, CQWD *vs* XSLJZD, CQWD *vs* XSLJZD + WM, SMD *vs* SMD + WM, SMD *vs* XSLJZD + WM, *vs* XSLJ

Table 3 Results of the surface under the cumulative ranking curve (%)													
	WM	BXXD	BXXD + WM	XSLJZD	XSLJZD + WM	SMD	SMD + WM	ZSXPD	ZSXPD + WM	CSLJD	CSLJD + WM	CQWD	JPXZD
Clinical effects	2.03	51.34	75.49	22.32	56.77	42.1	68.1	61.92	65.12	64.56	21.53	57.35	61.36
Nausea and vomiting scores	15.72	66.51	44.93	30.55	75.52	24.71	93.7	-	-	-	-	56.35	42.02
Anorexia scores	16.26	-	73.55	29.37	77.34	21.17	88.74	-	-	-	-	43.56	-
Early satiety scores	10.2	46.12	89.88	-	48.41	16.73	83.62	-	-	-	-	72.67	32.36
Bloating scores	9.88	71.13	78.56	28.76	38.13	17.14	98.98	-	-	-	-	67.3	40.12
MOT	9.72	24.36	52.91	-	30.21	61.42	71.2	0.33	-	97.26	92.27	37.05	73.27
SS	12.63	49.83	63.51	-	37.57	-	55.6	97.79	-	-	-	33.06	-
GAS	2.99	49.06	70.43	-	81.19	-	62.98	18.51	-	-	-	28.67	86.17
Gastric emptying time	11.8	28.03	66.87	47.69	-	-	27.55	-	30.22	93.89	94.08	77.61	22.26
Emptying rate	1.82	47.77	-	-	72.73		58.18	98.35	-	-	-	21.14	-
Adverse drug events	25.41	0.48	27.85	41.85	90.74	34.64	35.65	92.72	-	84.39	59.24	57.04	-

MOT: Motilin; SS: Somatostatin; GAS: Gastrin; WM: Western medicine; BXXD: Banxia Xiexin Decoction; XSLJZD: Xiangshaliujunzi Decoction; SMD: Simo Decoction; ZSXPD: ZhiShiXiaoPi Decoction; CSLJD: Chaishaoliujun Decoction; CQWD: Chaiqin-Wendan Decoction; JPXZD: Jianpi Xiaozhi Decoction.

SUCRA probability results (Figure 4F, Table 3) indicated that SMD + WM was most likely to succeed in raising anorexia scores. Following is a ranking of the thirteen interventions: SMD + WM (88.74%) > XSLJZD + WM (77.34%) > BXXD + WM (73.55%) > CQWD (43.56%) > XSLJZD (29.37%) > SMD (21.17%) > WM (16.26%).

Early satiety scores: A total of 13 RCTs reported the early satiety scores, including four types of TCM decoctions and seven types of interventions [WM *vs* BXXD (n = 1), WM *vs* BXXD + WM (n = 3), WM *vs* SMD (n = 1), WM *vs* SMD + WM (n = 2), WM *vs* SMD (n = 1), WM *vs* SMD + WM (n = 1), WM *vs* CQWD (n = 2), WM *vs* JPXZD (n = 3)] (Table 1). The network plot is presented in Figure 4G. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in early satiety scores, and details are illustrated in Figure 4H. Table 2 shows that BXXD + WM, SMD + WM, CQWD, XSLJZD + WM, BXXD, JPXZD, and SMD were greater to WM alone where difference was statistically significant. In addition, the differences between different interventions, such as BXXD *vs* BXXD + WM, BXXD *vs* CQWD, BXXD *vs* JPXZD, BXXD *vs* SMD, BXXD *vs* SMD + WM, CQWD *vs* SMD, CQWD *vs* SMD + WM *vs* SMD, BXXD *vs* SMD + WM, CQWD *vs* SMD, CQWD *vs* SMD + WM, JPXZD *vs* SMD + WM, SMD *vs* SMD + WM, SMD *vs* SMD, CQWD *vs* SMD + WM, JPXZD *vs* SMD + WM, SMD *vs* SMD + WM, WM *vs* SMD, HWM, SMD *vs* SMD + WM, WM *vs* SMD, HWM, SMD *vs* SMD + WM, WM *vs* SMD, CQWD *vs* SMD + WM, SMD *vs* SMD, CQWD *vs* SMD + WM, JPXZD *vs* SMD + WM, SMD *vs* SMD + WM *vs* SMD, CQWD *vs* SMD + WM, SMD *vs* SMD + WM, SMD *vs* SMD, CQWD *vs* SMD + WM, SMD *vs* SMD + WM, SMD *vs* SMD, CQWD *vs* SMD + WM, SMD *vs* SMD + WM, *vs* SMD, CQWD *vs* SMD *vs* SMD + WM, SMD *vs* SMD *vs* SMD + WM, *vs* SMD *vs* SMD

SUCRA probability results (Figure 4I, Table 3) showed that BXXD + WM have the most possibility to become the best intervention for improving early satiety scores. The ranking of thirteen interventions is







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Figure 2 Graph showing the included randomized controlled trials' risk of bias. The proportion of the total number of randomized controlled trials is represented on the horizontal axis, while the vertical axis displays the bias risk elements. The "unclear danger of bias" should be viewed as "low risk of bias" for the outcome whose evaluation procedure is objective.

> as follows: BXXD + WM (89.88%) > SMD + WM (83.62%) > CQWD (72.67%) > XSLJZD + WM (48.41%) > BXXD (46.12%) > JPXZD (32.36%) > SMD (16.73%) > WM (10.2%).

> Bloating scores: Eight different types of interventions and five different TCM decoctions were included in the 20 RCTs that reported the bloating ratings [WM vs BXXD (n = 2), WM vs BXXD + WM (n = 4), WM vs XSLJZD (n = 2), WM vs XSLJZD + WM (n = 2), WM vs SMD (n = 1), WM vs SMD + WM (n = 1), WM vs CQWD (n = 5), WM vs JPXZD (n = 3)] (Table 1). The network plot is presented in Figure 4J. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in bloating scores, and details are illustrated in Figure 4K. Table 2 shows there was statistically significant difference between SMD + WM,





Figure 3 Effect of traditional Chinese medicine decoctions on clinical effect. A: Network of comparisons for efficacy clinical effects; B: Pairwise metaanalyses of clinical effect: Herbal medicine vs western medicine; C: Surface under the cumulative ranking curve plots for clinical effects. The vertical axis represents cumulative probabilities and the horizontal axis represents rank. WM: Western medicine; BXXD: Banxia Xiexin Decoction; CQWD: Chaiqin-Wendan Decoction; CSLJD: Chaishaoliujun Decoction; JPXZD: Jianpi Xiaozhi Decoction; SMD: Simo Decoction; XSLJZD: Xiangshaliujunzi Decoction; ZSXPD: ZhiShiXiaoPi Decoction.

> BXXD + WM, BXXD, CQWD, JPXZD, XSLJZD + WM, XSLJZD, and SMD, which were superior to WM alone. In addition, there were also statistically significant differences between different interventions, such as BXXD vs BXXD + WM, BXXD vs CQWD, BXXD vs JPXZD, BXXD vs SMD, BXXD vs SMD + WM, BXXD vs XSLJZD, BXXD + WM vs CQWD, BXXD + WM vs JPXZD, BXXD + WM vs SMD, BXXD + WM vs SMD + WM, BXXD + WM vs XSLJZD, CQWD vs JPXZD, CQWD vs SMD, CQWD vs SMD + WM, CQWD vs XSLJZD, JPXZD vs SMD, JPXZD vs SMD + WM, SMD vs SMD + WM, SMD vs XSLJZD, and SMD + WM vs XSLJZD.

> SUCRA probability results indicate (Figure 4L, Table 3), the possibility of SMD + WM to become the best intervention for improving bloating scores is the most. The ranking of thirteen interventions is as follows: SMD + WM (98.98%) > BXXD + WM (78.56%) > BXXD (71.13%) > CQWD (67.3%) > JPXZD (40.12%) > XSLJZD + WM (38.13%) > XSLJZD (28.76%) > SMD (17.14%) > WM (9.88%).

Effect of traditional Chinese medicine decoctions on gastrointestinal hormones

Motilin: The MOT was reported in 22 RCTs, using seven different types of TCM decoctions and ten different types of treatments [WM vs BXXD (n = 2), WM vs BXXD + WM (n = 1), WM vs XSLJZD + WM (n = 3), WM vs SMD (n = 1), WM vs SMD + WM (n = 1), WM vs ZSXPD (n = 2), WM vs CSLJD (n = 3), WM vs CSLJD + WM (n = 2), WM vs CQWD (n = 3), WM vs JPXZD (n = 4)] (Table 1). The network plot is



Compared with WM		Mean	difference (95%Crl)
BXXD	0	-	-0.92 (-2., 0.13)
BXXD_WM		_	-0.49 (-1.3, 0.37)
CQWD			-0.69 (-1.4, -0.035)
JPXZD			-0.43 (-1.5, 0.60)
SMD		·	-0.027 (-1.5, 1.4)
SMD_WM	0		-2. (-3.5, -0.46)
XSLJZD			-0.17 (-1.6, 1.3)
XSLJZD_WM	``````````````````````````````		-1.1 (-2.3, -0.096)
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Compared with WM Mean difference (95%Crl) BXXD -0.72 (-1.9, 0.48) -1.8 (-2.6, -1.1) -1.4 (-2.2, -0.46) BXXD WM CQWD JPXZD -0.42 (-1.1, 0.28) SMD -0.029 (-1.3, 1.2) SMD WM -1.7 (-3., -0.42) -0.76 (-1.7, 0.13) XSLJZD_WM -3 Ó ż







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Figure 4 Effect of traditional Chinese medicine decoctions on symptom score. A: Network of comparisons for nausea and vomiting scores; B: Pairwise meta-analyses of nausea and vomiting scores: Herbal medicine vs Western medicine (WM); C: Surface under the cumulative ranking curve (SUCRA) plots for nausea and vomiting scores; D: Network of comparisons for anorexia scores; E: Pairwise meta-analyses of anorexia scores: Herbal medicine vs WM; F: SUCRA plots for anorexia scores; G: Network of comparisons for early satiety scores; H: Pairwise meta-analyses of early satiety scores: Herbal medicine vs WM; I: SUCRA plots for early satiety scores; J: Network of comparisons for bloating scores; K: Pairwise meta-analyses of bloating scores: Herbal medicine vs WM; L: SUCRA plots for bloating scores. The vertical axis represents cumulative probabilities and the horizontal axis represents rank. WM: Western medicine; BXXD: Banxia Xiexin Decoction; CQWD: Chaiqin-Wendan Decoction; CSLJD: Chaishaoliujun Decoction; JPXZD: Jianpi Xiaozhi Decoction; SMD: Simo Decoction; XSLJZD: Xiangshaliujunzi Decoction.

> presented in Figure 5A. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in MOT, and details are illustrated in Figure 5B. According to Table 2, only XSLJZD + WM was superior to WM alone, and the difference was statistically significant. Additionally, there were statistically significant differences between several interventions, including BXXD vs BXXD + WM, BXXD vs CSLJD, BXXD vs CSLJD + WM, BXXD vs JPXZD, BXXD vs SMD, BXXD vs SMD + WM, BXXD + WM vs CSLJD, BXXD + WM vs CSLJD + WM, CQWD vs CSLJD, CQWD vs CSLJD + WM, CQWD vs JPXZD, CQWD vs SMD and CQWD vs SMD + WM.

> As mentioned in SUCRA probability results (Figure 5C, Table 3), the ranking of the thirteen interventions is as follows: CSLJD (97.26%) > CSLJD + WM (92.27%) > JPXZD (73.27%) > SMD + WM (71.2%) > SMD (61.42%) > BXXD + WM (52.91%) > CQWD (37.05%) > XSLJZD + WM (30.21%) > BXXD (24.36%) > WM (9.72%) > ZSXPD (0.33%). CSLJD was the most likely to become the best intervention for improving MOT.

> Somatostatin: Nine RCTs in total, including five different TCM decoctions and six different types of interventions, reported the SS [WM vs BXXD (n = 2), WM vs BXXD + WM (n = 2), WM vs XSLJZD + WM (n = 1), WM vs SMD + WM (n = 1), WM vs ZSXPD (n = 2), WM vs CQWD (n = 1)] (Table 1). The network plot is presented in Figure 5D. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in SS, and details are illustrated in Figure 5E. Table 2 shows that only BXXD was superior to CQWD where the difference was statistically significant.

> SUCRA probability results (Figure 5F, Table 3) showed that ZSXPD was mostly likely to become the best intervention to improve on SS. The ranking of thirteen interventions is as follows: ZSXPD (97.79%) > BXXD + WM (63.51%) > SMD + WM (55.6%) > BXXD (49.83%) > XSLJZD + WM (37.57%) > CQWD (33.06%) > WM (12.63%).





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Figure 5 Effect of traditional Chinese medicine decoctions on gastrointestinal hormones. A: Network of comparisons for motilin (MOT); B: Pairwise meta-analyses of MOT: Herbal medicine vs Western medicine (WM); C: Surface under the cumulative ranking curve (SUCRA) plots for MOT; D: Network of comparisons for somatostatin (SS); E: Pairwise meta-analyses of SS: Herbal medicine vs WM; F: SUCRA plots for SS; G: Network of comparisons for gastrin (GAS); H: Pairwise meta-analyses of GAS: Herbal medicine vs WM; I: SUCRA plots for GAS. The vertical axis represents cumulative probabilities and the horizontal axis represents rank. WM: Western medicine; BXXD: Banxia Xiexin Decoction; CQWD: Chaiqin-Wendan Decoction; CSLJD: Chaishaoliujun Decoction; JPXZD: Jianpi Xiaozhi Decoction; SMD: Simo decoction; XSLJZD: Xiangshaliujunzi Decoction; ZSXPD: ZhiShiXiaoPi decoction.

> Gastrin: Thirteen RCTs altogether reported the GAS, with six different TCM decoctions and seven different types of treatments [WM vs BXXD (n = 2), WM vs BXXD + WM (n = 1), WM vs XSLJZD + WM (*n* = 1), WM *vs* SMD + WM (*n* = 1), WM *vs* ZSXPD (*n* = 2), WM *vs* CQWD (*n* = 2), WM *vs* JPXZD (*n* = 4)] (Table 1). The network plot is presented in Figure 5G. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in GAS, and details are illustrated in Figure 5H. As shown in Table 2, only XSLJZD + WM was superior to WM alone, where the difference was statistically significant.

> JPXZD was most likely to emerge as the best intervention for enhancing GAS, according to SUCRA probability results (Figure 5I, Table 3). The ranking of thirteen interventions is as follows: JPXZD (86.17%) > XSLJZD + WM (81.19%) > BXXD + WM (70.43%) > SMD + WM (62.98%) > BXXD (49.06%) > CQWD (28.67%) > ZSXPD (18.51%) > WM (2.99%).

Effect of traditional Chinese medicine decoctions on gastric emptying

Gastric emptying time: A total of 23 RCTs reported the gastric emptying time, including six types of TCM decoctions and nine types of interventions [WM vs BXXD (n = 2), WM vs BXXD + WM (n = 4), WM vs XSLJZD (n = 3), WM vs SMD + WM (n = 1), WM vs ZSXPD + WM (n = 1), WM vs CSLJD (n = 3), WM vs CSLJD + WM (n = 2), WM vs CQWD (n = 3), WM vs JPXZD (n = 4)] (Table 1). The network plot is presented in Figure 6A. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in gastric emptying time, and details are illustrated in Figure 6B. The superiority of all TCM decoctions over WM alone was statistically significant. Other decoctions' pairwise comparisons were statistically significant as well. The specifics are displayed in Table 2.

CSLJD + WM was found to be the most likely strategy to improve gastric emptying time in the SUCRA probability outcomes (Figure 6C, Table 3). Following is a ranking of the thirteen interventions: CSLJD + WM (94.08%) > CSLJD (93.89%) > CQWD (77.61%) > BXXD + WM (66.87%) > XSLJZD (47.69%) > ZSXPD + WM (30.22%) > BXXD (28.03%) > SMD + WM (27.55%) > JPXZD (22.26%) > WM (11.8%).

Emptying rate: There were 9 RCTs in all that reported the emptying rate, five of which used treatments and seven of which used TCM decoctions [WM vs BXXD (n = 2), WM vs XSLJZD + WM (n = 1), WM vs SMD + WM (n = 1), WM vs ZSXPD (n = 3), WM vs CQWD (n = 2)] (Table 1). The network plot is presented in Figure 6D. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in gastric rate, and details are illustrated in Figure 6E. According to Table 2, only BXXD, CQWD, and SMD + WM outperformed WM alone in a statistically significant way. Additionally, we discovered that BXXD outperformed CQWD, and the difference was statistically significant.

ZSXPD was the intervention that was most likely to succeed in raising the emptying rate, as shown by the SUCRA probability values (Figure 6F, Table 3). The following is a ranking of the thirteen interventions: ZSXPD (98.35%) > XSLJZD + WM (72.73%) > SMD + WM (58.18%) > BXXD (47.77%) >



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Figure 6 Effect of traditional Chinese medicine decoctions on gastric emptying. A: Network of comparisons for gastric emptying time; B: Pairwise meta-analyses of gastric emptying time: Herbal medicine vs western medicine (WM); C: Surface under the cumulative ranking curve (SUCRA) plots for gastric emptying time; D: Network of comparisons for emptying rate; E: Pairwise meta-analyses of emptying rate: Herbal medicine vs WM; F: SUCRA plots for emptying rate. The vertical axis represents cumulative probabilities and the horizontal axis represents rank. WM: Western medicine; BXXD: Banxia Xiexin Decoction; CQWD: Chaigin-Wendan Decoction; CSLJD: Chaishaoliujun Decoction; JPXZD: Jianpi Xiaozhi Decoction; SMD: Simo Decoction; XSLJZD: Xiangshaliujunzi Decoction; ZSXPD: ZhiShiXiaoPi Decoction.

CQWD (21.14%) > WM (1.82%).

Adverse drug events

A total of 19 RCTs reported the adverse drug event, including six types of TCM decoctions and ten types of interventions (WM vs BXXD (n = 1), WM vs BXXD + WM (n = 2), WM vs XSLJZD (n = 2), WM vs



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XSLJZD + WM (n = 1), WM vs SMD (n = 4), WM vs SMD + WM (n = 1), WM vs ZSXPD (n = 3), WM vs CSLJD (n = 2), WM vs CSLJD + WM (n = 1), WM vs CQWD (n = 2)) (Table 1). The network plot is presented in Figure 7A. Pairwise meta-analyses were conducted to compare TCM decoctions with WM in adverse devents vent, and details are illustrated in Figure 7B. Table 2 shows that only BXXD, XSLJZD + WM, and ZSXPD are different from WM, and the differences are statistically significant.

BXXD + WM was most likely to develop into the best intervention for enhancing clinical effects, according to SUCRA probability results (Figure 7C, Table 3). Following is a ranking of the thirteen interventions: ZSXPD (92.72%) > XSLJZD + WM (90.74%) > CSLJD (84.39%) > CSLJD + WM (59.24%) > CQWD (57.04%) > XSLJZD (41.85%) > SMD + WM (35.65%) > SMD (34.64%) > BXXD + WM (27.85%) > WM (25.41%) > BXXD (0.48%).

Publication Bias

Figure 8 displays the results of a comparative adjusted funnel plot for each outcome. Different interventions were identified by different colored points. Clinical effects' funnel plot analysis in Figure 8A revealed that the majority of the effects were in the middle and that the left and right were essentially symmetrical, indicating that the included literature's publication bias was minimal. Funnel plot analysis of symptom scores was performed in Figure 8B-E, and funnel plot analysis of GI hormones was performed in Figure 8F-H. The results showed that the left and right were not completely symmetrical, and most of them were in the upper part, suggesting that there was a certain publication bias. Figure 8I-K performed funnel plot analysis of gastric emptying and adverse drug events, and the results showed that the left and right were not completely symmetrical. Most scattered points fell in the middle of the funnel plot and concentrated near the vertical line X = 0, and some scattered points were distributed outside the funnel plot. This suggests that there is a certain publication bias. The reasons for bias may be related to the small sample size, incomplete clinical data, or the lack of blinding methods for data collection and processing. In addition, Supplementary Figures 1-11 summarize the heterogeneity of each outcome.

DISCUSSION

Chinese herbs and TCM decoctions were widely used in the treatment of diabetes and its related complications in ancient China, and a wealth of clinical experience has been accumulated [102,103]. There was no direct comparative study on various TCM decoctions combined with WM. At present, no investigators have performed NMA on TCM decoctions to treat DGP. Our NMA overcomes the lack of comparable data in head-to-head trials by offering unified hierarchies of evidence for all TCM decoctions and TCM decoction combined with WM in adults with DGP illness. In the present study, the results show the probability of each intervention program on the different possible rankings, at the same time, different intervention programs were also compared.

A total of seven different types of TCM decoctions (BXXD, XSLJZD, SMD, ZSXPD, CSLJD, CQWD, and JPXZD) were included in this study, and all the TCM decoctions included in this study have the effects of regulating the spleen and stomach and regulating the movement of Qi[104,105]. Numerous articles and reviews have covered the molecular mechanisms used to explain how these TCM decoctions' active components regulate GI motility [106,107]. BXXD is a famous Chinese herbal medicine prescription, which contains seven kinds of herbal medicines, and is composed of Rhizoma Pinelliae, Radix Scutellariae, Rhizoma Zingiberis, Panax ginseng, Coptis chinensis, Fructus jujube and Radix glycyrrhizae[108]. BXXD can treat DGP by inhibiting the apoptosis of gastric interstitial cells of Cajal, regulating the proportion of intestinal flora, inhibiting the release of inflammatory factors, regulating GI hormones, reducing blood glucose and improving insulin resistance[109,110]. XSLJZD contains eight commonly used herbs Panax ginseng, Rhizoma atractylodis macrocephalus, Poria, Radix glycyrrhiza, Pericarpium citri reticulate, Pinellia tuber, Fructus amomi, and Radix aucklandiae[111]. Moreover, XSLJZD has a bidirectional effect of excitation or inhibition of the GI tract, which can promote the secretion of digestive juice and accelerate gastric emptying through GI peristalsis[112-114]. SMD is mainly composed of Radix costumers, Aconitum Fructus, Fructus aurantii, and areca nut, which is the classic representative of TCM used in GI motility disorders[115,116]. ZSXPD is composed of Codonopsis, bitter orange, Atractylode, Poria, Pinellia, Salvia miltiorrhiza, malt, and so on[117]. Combined with WM, ZSXPD can effectively improve the level of GI hormones and GI function of patients, with fewer adverse reactions and drug safety, which is worthy of promotion[118,119]. CSLJD is composed of Bupleurum, Paeony, Panax ginseng, Atractylodes, Tangerine peel, Rhizoma Pinelliae, Poria cocos, glycyrrhiza Radix, etc. It can down-regulate the levels of inflammatory factors Tumor Necrosis Factor- α and Tumor Necrosis Factor- γ , and increase the contents of interleukin-1 β and interleukin-10, indicating that it can regulate the inflammatory response of the intestine and play a good therapeutic effect[120,121]. CQWD including Radix bupleurum, Scutellaria baicalensis, Rhizoma Pinelliae, bamboo mushroom, Citrus aurantium, Tangerine peel, Poria cocos, and glycyrrhiza radix, has been shown to reduce blood glucose, increase GI excitability and relieve GI spasm by altering the number of intestinal flora[122]. JPXZD is composed of Astragalus membranaceus, Rhizoma





Figure 7 Adverse drug events. A: Network of comparisons for adverse drug event; B: Pairwise meta-analyses of adverse drug event: Herbal medicine vs western medicine; C: Surface under the cumulative ranking curve plots for adverse drug event. The vertical axis represents cumulative probabilities and the horizontal axis represents rank. WM: Western medicine; BXXD: Banxia Xiexin Decoction; CQWD: Chaiqin-Wendan Decoction; CSLJD: Chaishaoliujun Decoction; JPXZD: Jianpi Xiaozhi Decoction; SMD: Simo Decoction; XSLJZD: Xiangshaliujunzi Decoction; ZSXPD: ZhiShiXiaoPi Decoction.

> polygonatum, Codonopsis pilosula, Xiangfu Rhizoma, Atractylodes, Bupleurum, turmeric rhizoma and Chuanxiong Rhizoma. This decoction can improve the plasma levels of SS and GAS, thereby reducing the inhibition of GI motility and promoting the recovery of GI motility[123].

> In order to select the best interventions based on TCM decoctions and better guide clinical decisionmaking based on TCM, we conducted a detailed literature review to make the included literature more comprehensive and our results more credible. The inclusion and exclusion criteria for this study were very strict. The use of TCM decoction alone or in conjunction with TCM and WM for all of the study's interventions lessened the effects of potential heterogeneity and improved the reliability of the findings. The results of NMA and SUCRA showed that BXXD + WM was the most effective in improving the clinical effect and early satiety score with WM as the common control; the SMD + WM was most effective in improving nausea and vomiting scores and anorexia scores, bloating scores; the CSLJD was most effective for MOT, the ZSXPD was most effective in SS and increased emptying rate; the JPXZD was most effective in GAS; the CSLJD + WM was most effective in improving gastric emptying rate. The clinical recommendation of TCM decoction requires a series of multifaceted evaluation methods. In this study, clinical effects and symptom ratings were utilized in this study as the main outcome measures for a thorough review. The results show that BXXD + WM and SMD + WM are probably the two most effective therapies, followed by CSLJD, ZSXPD, JPXZD, CSLJD + WM, ZSXPD + WM and CQWD, XSLJZD + WM, BXXD and SMD. Conclusions may vary depending on the main objectives and outcome indicators of the study. Previous meta-analysis studies have shown that oral BXXD is effective in the treatment of adult DGP and has less adverse effects [28], which is consistent with the results of our study.

> In terms of safety, 18 studies reported the occurrence of adverse reactions, all of which were mild, mainly manifested as diarrhea, fatigue, dizziness, drowsy, etc. No drug was stopped because of adverse reactions or adverse events, and the adverse reactions or adverse events in the observation group were



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Figure 8 Funnel Plots of different outcomes. A: Clinical effects; B: Nausea and vomiting scores; C: Anorexia scores; D: Early satiety scores; E: Bloating scores; F: Motilin; G: Somatostatin; H: Gastrin; I: Gastric emptying time; J: Emptying rate; K: Adverse drug events. WM: Western medicine; BXXD: Banxia Xiexin Decoction; CQWD: Chaiqin-Wendan Decoction; CSLJD: Chaishaoliujun Decoction; JPXZD: Jianpi Xiaozhi Decoction; SMD: Simo Decoction; XSLJZD: Xiangshaliujunzi Decoction; ZSXPD: ZhiShiXiaoPi Decoction.

less than those in the control group, indicating that TCM decoctions combined with WM in the treatment of DGP are safe.

Limitations

However, there are some limitations to our study. First off, the included RCTs had poor overall quality, and the majority of them did not provide detailed information on blinding, allocation concealment, selective reporting, and procedure registration. These restrictions might increase the chance of bias. Second, there were few direct comparisons between various combination therapies, and the majority of the study groups included in this analysis were indirect comparisons. Additionally, the accuracy of the results will be somewhat constrained because all of the studies that made up this study were carried out in China. The findings of this meta-analysis should be interpreted carefully given these restrictions. The standard of clinical research as a whole has to be raised as a result of these constraints. It is advised that clinical trials be carried out precisely following the most recent Consolidated Standards of Reporting Trials (CONSORT) recommendations to enhance the reporting quality of RCTs[124].

Future directions

TCM combined with WM effectively improves the total effective rate, cure rate, and gastric emptying function in DGP patients without increasing the risk of adverse reactions, and the curative effect is safe and reliable. These findings underpin the clinical use of TCM combined with WM in the treatment of DGP. The results of this review may help develop novel treatment strategies for DGP in the future.

CONCLUSION

In conclusion, the results of our meta-analysis suggest that qualified TCM decoction combined with WM is more effective than WM alone in treating patients with DGP. The BXXD + WM was the most effective in improving early satiety scores, and the SMD + WM was most effective in improving nausea and vomiting scores, anorexia scores, and bloating scores. The safety of these TCM decoctions needs to be further observed. Nevertheless, this finding still needs to be further verified, and due to various limitations, further high-quality, large-sample, double-blind, multi-center RCTs are needed.

ARTICLE HIGHLIGHTS

Research background

Diabetic gastroparesis (DGP) has a negative impact on the quality of life of patients. Although conventional western medicine gastric motility drugs like domperidone and metoclopramide can alleviate gastrointestinal (GI) pain, they also have some unfavorable side effects, and patients are easy to relapse after drug withdrawal.

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Research motivation

The GI symptoms in DGP patients can be improved by several Traditional Chinese Medicine (TCM) decoctions, which have been shown to be effective in treating the disease.

Research objectives

The goal of this study is to analyze the efficacy of several TCM decoctions in the treatment of DGP based on Bayesian network meta-analysis (NMA).

Research methods

PubMed, EMBASE, Cochrane Library, Web of Science, China National Knowledge Infrastructure, The China Biology Medicine DVD, Wanfang, and CQVIP were searched from the databases' inception to September 17, 2022 to gather randomized controlled trials about TCM decoctions for DGP. The main outcomes were symptom scores and clinical effects. The secondary outcomes included motilin (MOT), somatostatin (SS), gastrin (GAS), gastric emptying rate, gastric emptying time, and adverse medication events.

Research results

NMA and the surface under the cumulative ranking curve studies demonstrated that, using western medicine (WM) as a common control, the Banxia Xiexin Decoction (BXXD) + WM was the most effective in the improvement of early satiety scores; the Simo decoction (SMD) + WM was the most effective in improving nausea and vomiting scores, anorexia scores, and bloating scores; the Chaishao Liujunzi Decoction (CSLJD) was the most effective for MOT; the Zhishi Xiaopi Decoction (ZSXPD) was the most effective for improving SS and emptying rate; the Jianpi Xiaozhi Decoction was the most effective for GAS; and the CSLJD + WM was the most effective in improving gastric emptying time.

Research conclusions

TCM decoction combined with WM is more effective than WM alone in treating patients with DGP.

Research perspectives

These NMA findings may aid in the development of DGP treatments and, as a consequence, enhance treatment effectiveness and patient wellbeing.

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FOOTNOTES

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