

Comparison of Traditional Chinese Medicine and Traditional Thai Medicine on Their Theories and Therapeutic Prescriptions in the Treatment of Female Infertility

Saowaluck Meesin^{1*}, Wen XiaoPing², Zheng WenJie³

¹Faculty of Chinese Medicine, Huachiew Chalermprakiet University, 18/18 Bangna-Trad Rd, Samutprakan, 10540 Thailand

²Fundamental of Traditional Chinese Medicine Colleague, Shanghai University of Traditional Chinese Medicine, no.1200 Cailun Road, Zhangjiang High-tech Park, Pudong New District, Shanghai City, China. Email

³Tian Fah Foundation Hospital, no 606 Yaowarat Road, Samphanthawong District, Bangkok 10100 Thailand

*Email : jingshumeesin@gmail.com

ABSTRACT

Objective: To systematize and analyze the differences between traditional Chinese medicine (TCM) and traditional Thai medicine (TTM) on their theories and therapeutic prescriptions for the treatment of female infertility in Thai patients and provide the prescription compatibility of herbal formulas for Thai female infertility. **Methods:** Systematized and analyzed 228 published papers and 161 textbooks on TCM and 87 published papers together with 29 textbooks on TTM and herbal prescriptions for female infertility treatment that were collected from 2008 until July 2018, and the historical texts for TCM documents, and all data from 1782 until July 2018 for TTM from the Medline, Cochrane, CBM, CNKI, and the ThaiJO database. In addition, we referenced books relevant to female infertility in TCM and TTM and analyzed reference lists of relevant articles from the Shanghai University of TCM, Thai National Library, and reviewed numerous TCM prescriptions from Tianfa Hospital, ZhengWenjie TCM Clinic. The methodology used to analyze the prescription patterns included datamining and statistical analysis using IBM SPSS 21.0 for Windows, and IBM SPSS Modeler Subscription (Apriori), which were used to analyze the frequency and association rules among the prescriptions. **Results:** The results showed that TCM and TTM have similar explanations on the principles of getting pregnant, infertility factors, disease mechanism, and therapeutic theories for the treatment of female infertility. The analyzed treatment results show that both TCM and TTM were based on understanding the disease mechanisms and to use a holistic diagnosis pattern, followed by choosing the appropriate treatment options available. The results of TCM and TTM prescription compatibility patterns in the treatment of Thai female infertility showed TCM's most important compatible prescription herbs were "*Bupleurum chinensis* - Dry human placenta, *Cuscuta chinensis* - *Morus alba* - *Curculigo orchioides* - *Epimedium brevicornum*"; TCM prescriptions to treat Thai female infertility focused on the nourishment of Qi and blood, warm and tonify kidney-Yang, regulate Chong and Ren meridians, disperse liver Qi stagnation, promote blood circulation, and remove blood stasis. "*Atractylodes lancea* - *Angelica dahurica*", "*Piper sarmentosum* - *Piper interruptum* - *Zingiber officinale* - *Piper retrofractum* - *Plumbago indica*" were the most compatible herbal found. TTM prescriptions to treat Thai infertility regulate and nourish the four(4) basic body elements, nourish blood, nourish the fire element to eliminate cold inside the body, eliminate blood stasis, and treat all other blood disorders. **Conclusions:** There are similarities between TCM and TTM on the diagnosis and treatment of female infertility; however, there are differences in how TCM and TTM explain the underlying causes of infertility. Both TCM and TTM's diagnoses are based on a holistic view and understanding of the body's organs and systems. Most of the Thai female infertility patients analyzed in this research had a "cold and deficiency pattern", and so the main treatment methods for both TCM and TTM are to prescribe herbs to regulate the menstrual cycle and flow, nourish blood, regulate and treat uterine disease, improve body circulation, and remove blood stasis. There are, however, differences between TCM and TTM in terms

of the specific herbal prescriptions used to treat infertility, which are based on their specific paradigms and understanding of the root causes of female infertility.

Keywords : female infertility; traditional Chinese medicine (TCM); traditional Thai medicine (TTM); prescription pattern; data mining

Introduction

Female infertility is defined as the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse ^[1], and is currently becoming a worldwide reproductive health concern. Although not a fatal disease, there are serious impacts on both the physical and mental health of those affected, and it has become a problem for society as a whole ^[2-3]. According to the Center for Disease Control and Prevention, CDC, the estimated incidence of infertility is gradually increasing ^[4]. The causes of female infertility are complex, and caused by a range of factors, such as abnormalities of the ovaries, uterus, fallopian tubes, the endocrine system, or there may be other unknown causes. The treatment of female infertility remains a challenge for healthcare providers.

Traditional Chinese medicine (TCM) and Thai traditional medicine (TTM) are two of the most important alternative fields of medicine available in Thailand for the diagnosis and treatment of female infertility. The field of traditional Chinese medicine especially, has developed comprehensive diagnosis and treatment options for female infertility, which have been developed over the past several hundred years.

Traditional Chinese Medicine theory claims that "the kidney controls the reproductive system", and therefore, the kidney's essence plays an important role for the basis of human growth, development, and reproduction ^[5]. There are several potential causes of female infertility, such as the six external factors and seven emotions (excess of certain emotions), damage of Chong and Ren meridians, and so on, among those, deficiency in the spleen and kidney, stagnation of liver qi, deficiency of blood, qi and yang, and a disorder of Chong and Ren meridians, phlegm and dampness, are believed to be most important causes ^[6-8]. Therefore, invigorating the kidney and liver, strengthening the spleen, soothing the liver and modifying the patients mental state, promoting blood circulation and removing blood stasis, invigorating the spleen, removing phlegm and dampness, also nourishing qi, yang and blood are the main treatment methods in TCM ^[9-10]. According to its clinical efficacy and safety ^[11-12], choosing traditional Chinese medicine to treat female infertility is one of the effective options.

Thai traditional medicine Thai traditional medicine also has comprehensive diagnosis and treatment procedures for gynecological diseases, including female infertility. Thai traditional medicine focuses on the collection and analysis of a patient's comprehensive medical history and comparing it with the factors that lead to gynecological disease according to TTM. "Tard -chao-ruan" is the most basic substance in human life. The imbalance of "Tard -chao-ruan" is a major factor in the progression of any disease. The etiology and pathogenesis of female infertility in Thailand are complex, and are recorded in "Khamphi Mahachotrat". "Prathomjinda", an important TTM textbooks on gynecology, states believes that there are internal and external factors that cause the imbalance of blood and "Tard-chao-ruan" and the imbalance of "the 4 elements" in the patient's body, thus leading to menstrual disorders, as well as other disorders, which are the main causes and pathogenesis of female infertility. Therefore, reconciling and nourishing the blood are the main treatment options for female infertility ^[13-14].

Traditional Chinese medicine (TCM) and Thai traditional medicine (TTM) have similar but distinct treatments for female infertility; each having an advantage over the other in some respect. The objective of this research is to systematize and analyze the differences between traditional Chinese medicine (TCM) and traditional Thai medicine (TTM) on their theories and therapeutic prescriptions for the treatment of female infertility in Thai patients, and provide the theoretical basis and references for the continued learning exchange between TCM and TTM.

METHODOLOGY

1. DOCUMENT ANALYSIS

Inclusion criteria (published papers and textbooks)

1. Qualitative research on Chinese medicine, Chinese herbal medicine for female infertility treatment is included.
2. No limits to the research methodology.
3. Studies on infertile women with primary and secondary infertility without age limits.
4. All literature published from 1782 until July 2018, published in English, Thai, and Chinese for TTM.
5. Published papers in English, and Chinese on TCM topics from 2008 until July 2018.
6. Relevant textbooks published until 2018.

Exclusion criteria

1. Not a full research report or abstracts of articles/papers (if only abstract was available)
2. Research conducted with samples other than women or infertile couples.
3. Research in a language other than English, Chinese, and/or Thai.

We systematized and analyzed 228 published papers and 161 textbooks on TCM and 87 published papers and 29 textbooks on TTM and herbal prescriptions for the treatment of female infertility collected between 2008 and 2018 (July), historical texts on TCM, and all data from 1782 until 2018 (July) for TTM from the Medline, Cochrane, CBM, CNKI, and the ThaiJO database by using the following search terms: ‘infertility’, ‘female infertility’, ‘Chinese medicine’, ‘Chinese herbal medicine’, ‘Traditional Chinese medicine’, ‘TCM’, ‘woman disease’, ‘Thai Traditional medicine’, ‘Thai herbal medicine’, and ‘TTM’. Additionally, we sourced books relevant to female infertility in TCM and TTM and checked reference lists of relevant articles from the Shanghai University of TCM, and the Thai National Library.

2. STATISTICAL ANALYSIS (DATA MINING ANALYSIS)

Data mining and statistical analysis was used to analyze the TCM and TTM prescription patterns for treating female infertility from Tianfa Hospital, ZhengWenjie TCM Clinic from January 2014 – August 2018. Data was input into Excel 2010 and statistical analysis was performed by IBM’s SPSS Statistic Base 21.0; specifically, analysis was conducted on herbal use frequency. The statistical software identified the frequency of herb types used in TCM and TTM prescriptions in the treatment of female infertility; herbs with average and above average frequency for us in prescriptions were identified as core herbs.

The Apriori algorithm (an algorithm that is used in mining frequent products sets and relevant association rules.) of the IBM SPSS Modeler Subscription statistical software was used to screen out the association rules of prescriptions: the minimum support in TCM prescriptions is 0.3, the minimum confidence was 0.9, and the minimum support refers to the probability of A and B appearing at the same time, it is a measure of the accuracy of

association rules; confidence refers to the probability that when A occurs, B will probably occur, it is a measure of the importance of association rules; minimum support and confidence determined the lift degree, lift value was more than 1, the larger value of lift referred significance of core herbs in prescription.

Result

1. Frequency analysis of TCM prescriptions for female infertility treatment in Thai Patients.

Result showed two hundred twenty-three (223) TCM prescriptions for female infertility in Thailand were collected. One hundred sixty-two (162) herbs, with a total frequency of 3,182. The top 10 most frequently prescribed traditional Chinese herbs are *Pseudostellaria heterophylla*, *Eucommia ulmoides*, *Epimedium brevicornum*, *Astragalus membranaceus*, *Lycium barbarum*, *Cuscuta chinensis*, *Morus alba*, *Curculigo orchioides*, *Atractylodes macrocephala*, *Glycyrrhiza uralensis*. See table 1.

Table 1 Frequency of TCM herbs prescribed to Thai patients for the treatment of female infertility

Scientific name	Frequency	frequency rate (%)	Scientific name	Frequency	frequency rate (%)
<i>Pseudostellaria heterophylla</i>	155	4.9	<i>Sedum sarmentosum</i>	84	2.6
<i>Eucommia ulmoides</i>	131	4.1	<i>Paeonia lactiflora</i>	83	2.6
<i>Epimedium brevicornum</i>	129	4.1	<i>Adenophora tetraphylla</i>	74	2.3
<i>Astragalus membranaceus</i>	128	4	<i>Codonopsis pilosula</i>	67	2.1
<i>Lycium barbarum</i>	121	3.8	<i>Salvia miltiorrhiza</i>	58	1.8
<i>Cuscuta chinensis</i>	108	3.4	<i>Citrus reticulata</i>	55	1.7
<i>Morus alba</i>	107	3.4	<i>Dioscoria opposita</i>	52	1.6
<i>Curculigo orchioides</i>	107	3.4	<i>Angelina sinensis</i>	52	1.6
<i>Atractylodes macrocephala</i>	104	3.3	<i>Plantago asiatica</i>	48	1.5
<i>Glycyrrhiza uralensis</i>	104	3.3	<i>Trichosanthes kirilowii</i>	45	1.4
<i>Bupleurum chinensis</i>	94	3	<i>Saposhnikovia divaricata</i>	41	1.3
Dry human placenta	91	2.9	<i>Foeniculum vulgare</i>	40	1.3
<i>Rehmannia glutinosa</i>	89	2.8	<i>Polygonatum sibiricum</i>	40	1.3

Source: Analysis based on prescriptions written for treating female infertility between January 2014 and August 2018 at Tianfa Hospital, ZhengWenjie TCM Clinic.

2. Frequency analysis of TCM herb types prescribed to Thai patients to treat female infertility.

The results show that tonic herbs, heat-clearing herbs, and herbs that promote blood circulation and remove blood stasis are used more frequently than other types of herbs. Among those, tonic herbs have the highest frequency used. See table 2.

Table 2 Frequency of TCM herb types prescribed to Thai patients to treat female infertility.

Herbal categories	Frequency	Frequency rate (%)
Tonic herb	39	24.1
Heat-clearing herb	25	15.4
Herb to promote blood circulation and remove blood stasis	19	11.7
Diaphoretic herb	13	8
Diuresis and diffusing dampness herb	9	5.6
Qi-regulating herb	9	5.6
Liver-Pacifying Wind-Extinguishing herb	8	4.9
Phlegm treatment and cough suppression herb	7	4.3
Sedative herb	7	4.3

Source: Analysis based on prescriptions written for treating female infertility between January 2014 and August 2018 at Tianfa Hospital, ZhengWenjie TCM Clinic

3. Frequency analysis of TTM prescriptions for female infertility treatment in Thai Patients.

Eighty-five (85) TTM prescription were collected, and 299 herbs were used; the total frequency was 1,341. The top 10 most frequently prescribed TTM herbs were *Piper retrofractum*, *Zingiber officinale*, *Piper nigrum*, *Nigella sativa*, *Plumbago indica*, *Piper interruptum*, *Piper ribesoides*, *Piper sarmentosum*, *Angelica dahurica*, *Cuminum cyminum*, *Myristica fragrans*. See table 3.

Table 3 Frequency of TTM herbs prescribed to Thai patients for the treatment of female infertility

Scientific name	Frequency	frequency rate(%)	Scientific name	Frequency	frequency rate (%)
<i>Piper retrofractum</i>	48	3.6	<i>Lepidium sativum</i>	16	1.2
<i>Zingiber officinale</i>	48	3.6	<i>Amomum krervanh</i>	16	1.2
<i>Piper nigrum</i>	41	3.1	<i>Allium sativum</i>	15	1.1
<i>Nigella sativa</i>	35	2.6	<i>Myristica fragrans</i>	15	1.1
<i>Plumbago indica</i>	33	2.5	<i>Tarenna hoensis</i>	15	1.1
<i>Piper interruptum</i>	27	2	<i>Terminalia bellirica</i>	15	1.1
<i>Piper sarmentosum</i>	26	1.9	<i>Zingiber cassumunar</i>	15	1.1
<i>Angelica dahurica</i>	22	1.6	<i>Anethum graveolens</i>	14	1
<i>Cuminum cyminum</i>	22	1.6	<i>Acorus calamus</i>	14	1
<i>Myristica fragrans</i>	22	1.6	<i>Phyllanthusemblica</i>	13	1
<i>Syzygium aromaticum</i>	22	1.6	<i>Citrus hystrix</i>	11	0.8
<i>Cyperus rotundus</i>	19	1.4	<i>Euphorbia antiquorum</i>	11	0.8
<i>Atractylodes lancea</i>	18	1.3	<i>Cinnamomum bejolghota</i>	11	0.8
<i>Ligusticum sinense</i>	18	1.3	<i>Carthamus tinctorius</i>	11	0.8
<i>Angelica sinensis</i>	18	1.3	<i>Aquilaria crassna</i>	10	0.7
<i>Foeniculum vulgare</i>	17	1.3	<i>Tinospora crispa</i>	10	0.7
<i>Dracaena loureiroi</i>	17	1.3	<i>Cinnamomum bejolghota</i>	10	0.7
<i>Artemisia annua</i>	17	1.3	<i>Curcuma zedoaria</i>	10	0.7
<i>Terminalia chebula</i>	16	1.2			

Source: Analysis based on prescriptions written for treating female infertility in TTM historical textbooks.

4. Frequency analysis of TTM herbal types used for female infertility treatment in Thai Patients

The most frequently prescribed TTM herb properties are hot tasting herbs (51.8%), followed by cold tasting herbs, and finally mild tasting herbs. See Table 4.

Table 4 Frequency of TTM herb types prescribed to Thai patients for the treatment of female infertility

Herbal properties	Frequency	Frequency rate (%)
Hot taste	694	51.8
Cold Taste	338	25.2
Mild Taste	307	22.9

Source: Analysis based on prescriptions written for treating female infertility in TTM historical textbooks.

5. Association analysis.

5.1 Association analysis of TCM prescriptions

Several important herb/drug combinations were identified in the association analysis for TCM herbal prescriptions, which are: *Curculigo orchioides* - *Epimedium brevicornum*; *Bupleurum chinensis* - *Dry human placenta* - *Cuscuta chinensis* - *Morus alba*; *Dry human placenta* - *Epimedium brevicornum* - *Cuscuta chinensis* - *Morus alba*. See table 5.

Table 5 Key associations of Chinese herbal medicines prescribed for the treatment of female infertility in Thailand.

Consequent	Antecedent	Support %	Confidence %	Lift
<i>Curculigo orchioides</i>	<i>Epimedium brevicornum</i>	0.457	0.953	1.6 48
<i>Cuscuta chinensis</i>	<i>Morus alba</i>	0.453	0.944	1.9 67
<i>Bupleurum chinensis</i> Dry human placenta	<i>Cuscuta chinensis</i>	0.300	0.957	1.9 95
<i>Bupleurum chinensis</i> Dry human placenta	<i>Morus alba</i>	0.309	0.986	2.0 54
Dry human placenta <i>Cuscuta chinensis</i> Dry human placenta)	<i>Morus alba</i>	0.363	0.988	2.0 59
<i>Epimedium brevicornum</i> <i>Atractylodes macrocephala</i> <i>Morus alba</i>	<i>Morus alba</i>	0.323	0.960	2.0 01
<i>Bupleurum chinensis</i> <i>Cuscuta chinensis</i>	<i>Bupleurum chinensis</i>	0.305	0.944	2.2 41
<i>Bupleurum chinensis</i> <i>Morus alba</i>	<i>Morus alba</i>	0.327	0.986	2.0 56
<i>Bupleurum chinensis</i> <i>Morus alba</i>	<i>Cuscuta chinensis</i>	0.327	0.948	1.9 76
<i>Atractylodes macrocephala</i> <i>Cuscuta chinensis</i>	<i>Morus alba</i>	0.300	0.971	2.0 24
<i>Cuscuta chinensis</i> <i>Curculigo orchioides</i>	<i>Morus alba</i>	0.309	0.986	2.0 54
<i>Cuscuta chinensis</i> <i>Curculigo orchioides</i>	<i>Epimedium brevicornum</i>	0.305	0.971	1.6 79
<i>Morus alba</i> <i>Curculigo orchioides</i>	<i>Epimedium brevicornum</i>	0.318	0.973	1.6 81
<i>Lycium barbarum</i> <i>Curculigo orchioides</i>	<i>Epimedium brevicornum</i>	0.323	0.973	1.6 82
<i>Pseudostellaria heterophylla</i> <i>Curculigo orchioides</i>	<i>Epimedium brevicornum</i>	0.359	0.964	1.6 66
<i>Lycium barbarum</i> <i>Morus alba</i>	<i>Cuscuta chinensis</i>	0.368	0.965	2.0 11
<i>Epimedium brevicornum</i> <i>Cuscuta chinensis</i>	<i>Morus alba</i>	0.386	0.977	2.0 37
<i>Bupleurum chinensis</i> Dry human placenta <i>Cuscuta chinensis</i>	<i>Morus alba</i>	0.300	1.000	2.0 84
<i>Bupleurum chinensis</i> Dry human placenta <i>Morus alba</i>	<i>Cuscuta chinensis</i>	0.300	0.971	2.0 24
Dry human placenta	<i>Morus alba</i>	0.314	1.000	2.0

Consequent	Antecedent	Support %	Confidence %	Lift
<i>Epimedium brevicornum</i> <i>Cuscuta chinensis</i>				84

5.2 Association analysis of TTM prescriptions

Several important herb/drug combinations were identified in the association analysis for TTM herbal prescriptions, which are: *Atractylodes lancea* - *Angelica dahurica*; *Piper sarmentosum*- *Zingiber officinale* - *Piper retrofractum*; *Piper sarmentosum* - *Piper interruptum* - *Zingiber officinale* - *Piper retrofractum*; *Piper sarmentosum* - *Piper interruptum* - *Plumbago indica* - *Zingiber officinale*. See table 6.

Table 6 Results of association rules for TTM herbal used for female infertility (n=56); herb names are in Latin

Consequent	Antecedent	Support %	Confidence %	Lift
<i>Piper sarmentosum</i>	<i>Plumbago indica</i>	0.282	0.923	2.378
<i>Atractylodes lancea</i>	<i>Angelica dahurica</i>	0.212	1.000	3.864
<i>Ligusticum sinense</i>	<i>Angelica sinensis</i>	0.200	0.944	4.460
<i>Cuminum cyminum</i>	<i>Nigella sativa</i>	0.224	0.864	2.097
<i>Piper sarmentosum</i> , <i>Piper interruptum</i> ,	<i>Plumbago indica</i>	0.247	0.913	2.352
<i>Piper sarmentosum</i> , <i>Piper interruptum</i>	<i>Piper retrofractum</i>	0.247	0.913	1.617
<i>Piper retrofractum</i> , <i>Piper sarmentosum</i>	<i>Piper interruptum</i> ,	0.247	0.913	2.874
<i>Piper retrofractum</i> , <i>Piper interruptum</i> , <i>Piper ribesoides</i>	<i>Piper sarmentosum</i>	0.247	0.913	2.985
<i>Piper sarmentosum</i> , <i>Zingiber officinale</i>	<i>Plumbago indica</i>	0.212	0.947	2.440
<i>Piper retrofractum</i> , <i>Piper sarmentosum</i>	<i>Plumbago indica</i>	0.247	0.913	2.352
<i>Piper sarmentosum</i> , <i>Zingiber officinale</i>	<i>Piper retrofractum</i>	0.224	1.000	1.771
<i>Piper retrofractum</i> , <i>Piper sarmentosum</i>	<i>Zingiber officinale</i>	0.224	0.826	1.463
<i>Piper interruptum</i> , <i>Zingiber officinale</i>	<i>Plumbago indica</i>	0.224	0.950	2.447
<i>Piper interruptum</i> , <i>Plumbago indica</i>	<i>Piper retrofractum</i>	0.247	0.840	1.488
<i>Piper retrofractum</i> , <i>Piper interruptum</i>	<i>Plumbago indica</i>	0.247	0.913	2.352
<i>Piper retrofractum</i> , <i>Plumbago indica</i>	<i>Piper interruptum</i>	0.247	0.840	2.644
<i>Piper interruptum</i> , <i>Piper ribesoides</i> , <i>Zingiber officinale</i>	<i>Piper retrofractum</i>	0.224	0.950	1.682
<i>Piper sarmentosum</i> , <i>Zingiber officinale</i> , <i>Plumbago indica</i>	<i>Piper retrofractum</i>	0.224	0.905	1.602
<i>Piper retrofractum</i> , <i>Piper sarmentosum</i> , <i>Piper interruptum</i> ,	<i>Plumbago indica</i>	0.224	0.905	2.330
<i>Piper retrofractum</i> , <i>Piper sarmentosum</i> , <i>Plumbago indica</i>	<i>Piper interruptum</i>	0.224	0.905	2.848

Consequent	Antecedent	Support %	Confidence %	Lift
<i>Piper retrofractum</i> , <i>Piper interruptum</i> , <i>Plumbago indica</i>	<i>Piper sarmentosum</i>	0.224	0.905	2.958
<i>Piper sarmentosum</i> , <i>Piper interruptum</i> , <i>Zingiber officinale</i>	<i>Piper retrofractum</i>	0.200	1.000	1.771
<i>Piper sarmentosum</i> , <i>Piper interruptum</i> , <i>Plumbago indica</i>	<i>Piper retrofractum</i>	0.212	1.000	1.771
<i>Piper retrofractum</i> , <i>Piper sarmentosum</i> , <i>Piper interruptum</i> ,	<i>Plumbago indica</i>	0.212	0.857	1.518
<i>Piper retrofractum</i> , <i>Piper sarmentosum</i> , <i>Piper interruptum</i> ,	<i>Plumbago indica</i>	0.212	0.947	2.440
<i>Piper retrofractum</i> , <i>Plumbago indica</i> , <i>Zingiber officinale</i>	<i>Piper sarmentosum</i>	0.212	0.857	2.802
<i>Piper interruptum</i> , <i>Plumbago indica</i> , <i>Zingiber officinale</i>	<i>Piper retrofractum</i>	0.212	0.947	1.678
<i>Piper retrofractum</i> , <i>Piper interruptum</i> , <i>Plumbago indica</i>	<i>Zingiber officinale</i>	0.212	1.518	0.857
<i>Piper retrofractum</i> , <i>Piper interruptum</i> , <i>Piper ribesoides</i> , <i>Zingiber officinale</i>	<i>Plumbago indica</i>	0.212	0.947	2.440
<i>Piper retrofractum</i> , <i>Plumbago indica</i> , <i>Zingiber officinale</i>	<i>Piper interruptum</i>	0.212	0.857	2.698

6. Theoretical comparison of TCM and TTM in the treatment of female infertility

Both TCM and TTM have a long history, dating back several thousand years. According to the records in historical textbooks, the female infertility treatment theory was first seen over 2,000 years ago in "Huangdi Neijing". Female infertility in TCM has been substantially researched in terms of theory, clinical efficacy, and safety, and it is constantly developing. Traditional Chinese medicine is becoming more important in the treatment of female infertility. The development of TTM corresponds with the developmental history of Thailand. Since 273 BC, ancient Indian medicine entered Thailand and the traditional medical culture at that time was combined with local medical theory to form the basis of modern day system of Thai traditional medicine. The principles, methods, prescriptions of Thai medicine for treating female infertility are mainly found in "Prathomjinda", "Thartwiphang", "Maha Chotirat"; in particular, "Maha Chotirat" is the most important ancient book on the treatment of women's miscellaneous diseases.

6.1 Mechanism of Pregnancy in TCM and TTM

Traditional Chinese medicine explains the conditions of pregnancy as mainly the age at which the kidney essence of both male and female are full and ready for reproduction (Tianguai) , the qi and blood of women are full and smooth, yin and yang are balanced, and after intercourse, conception will be possible. It is pointed out that being full of kidney essence and sufficient and smooth qi and blood are the important conditions for getting pregnant in TCM theory. Thai traditional medicine explains that there are two important conditions needed in order to successfully conceive, which are: 1) the woman has a regular menstruation cycle, sufficient blood, and a normal uterus; and 2) couples have proper intercourse condition.

Based on the literature, TCM and TTM have similar theories on getting pregnant, which are based on two main conditions: 1) "sufficient blood, normal menstruation"; and 2) "men and women should have proper sex". Differences between TCM and TTM is that a key condition in TCM requires "the kidney essence and smooth and sufficient qi, and the balancing of yin and yang", while a key condition in TTM is a "normal uterus".

6.2 Etiology and pathogenesis of female infertility in TCM and TTM

Traditional Chinese medicine and Thai traditional medicine similarly explain the etiology of female infertility. For congenital and pathogenic etiology, TCM will focus on the "5 abnormalities" of the female reproductive system. If any of the five abnormalities are present, medication will be an ineffective treatment for female infertility. Congenital etiology of female infertility in TTM are genetic issues that cause amenorrhea or a light blood flow during menstruation. The two most common pathogeneses of female infertility in traditional Chinese medicine are kidney deficiency and spleen deficiency, both of which cause a deficiency in qi and blood and affects the uterus and *Chong Ren* meridians. Kidney and spleen deficiencies can also cause liver qi stagnation, blood stasis, internal phlegm, and dampness, which can prevent the uterus from functioning properly, and thereby causing infertility. In traditional Thai medicine, the pathogenesis of female infertility is insufficient blood, an irregular menstrual cycle, and abnormal changes in the uterus.

Thus, TCM and TTM have common pathogenesis etiology for female infertility. They both focus on the woman's blood, menstruation, and health of the uterus. The difference was just in their specific theoretical understanding.

Additionally, both TCM and TTM point to similar unhealthy lifestyle factors as contributing factors of female infertility, such as an improper diet, being overworked, being excessively emotional, and so on. However, there are some differences as well. For example, in traditional Chinese medicine, anger can damage the liver, but in Thai traditional medicine, anger reduces the blood level.

6.3 Treatment principles and methods

Based on the main treatment principles of both TCM and TTM for female infertility, the common important treatment principle is "treatment aiming at the condition's pathogenesis". Traditional Chinese medicine treatment based on "syndrome differentiation" focuses on warming and nourishing the kidney's yang, nourishes qi and blood, soothing liver and regulating qi, promote blood circulation and remove blood stasis, dry dampness, and reduce phlegm. Thai traditional medicine has a similar holistic view as TCM. The treatment methods used in TTM are based on etiology and pathogenesis of the individual patient and also focuses on relevant factors such as age, living conditions, and so on; the main treatment focuses on regulating menstruation, balancing and nourishing the body's four elements, nourishing the blood, promote blood circulation and remove blood stasis, eliminate bad blood, and blood detoxification.

6.4 The prevention and care theory

Both TCM and TTM encourage a healthy lifestyle and having a proper diet are important factors in preventing female infertility. In Traditional Chinese medicine, greasy products, and alcohol consumption should be minimized to avoid spleen deficiency that can produce phlegm-dampness inside the body and causes insufficient blood and qi production. In Thai traditional medicine, it is suggested that foods that are too spicy be avoided because they cause blood deficiency, and that a person's diet should focus on nourishing the body's four elements.

Both TCM and TTM agree that mental health and emotional regulation are important to preventing infertility; both mention “peace of mind”. In TCM, emotions can be regulated using herbal medication and exercise. In TTM, the use of meditation to promote peace of mind. Peace of mind is related to the normal function of the liver, spleen, and kidney in TCM, and is related to blood sufficiency in TTM. An appropriate sexual condition is also important to mental health. Excessive sexual activity, or inappropriate sex conditions cause kidney essence yin and yang deficiencies according to TCM, and cause blood deficiency in TTM. Therefore, both TCM and TTM encourage properly engaging in sexual intercourse and having a calm mind during intercourse, which can nourish the blood and prevent infertility.

7. The prescription rules and pattern of TCM and TTM for female infertility treatment

7.1 Discussion on the overall prescription and compatibility of traditional Chinese medicine for the treatment of infertility in Thai female patients

According to the analysis of TCM prescriptions, it was suggested that Dr. Zheng's basic herbal types used structure for the treatment of female infertility in Thailand and follows: “nourishing group – heat clearing group – blood circulation promotion and removal of blood stasis group - treatment exterior symptoms group”. The reason of using exterior symptoms treatment herbs, *Bupleurum chinensis*, *Mentha Canadensis*, because both were related to liver meridian and it was used for soothing and regulating liver qi in the prescriptions. The data mining analysis showed the herbs used with thigh highest frequency wer *Pseudostellaria heterophylla*, *Eucommia ulmoides*, *Epimedium brevicornum*, *Astragalus membranaceus*, *Lycium barbarum*, *Cuscuta chinensis*, *Morus alba*, *Curculigo orchioides*, *Atractylodes macrocephala*, *Glycyrrhiza uralensis*, *Bupleurum chinensis*, dry human placenta, *Rehmannia glutinosa*, *Sedum sarmentosum*, and *Paeonia lactiflora*. According to the drug association analysis that is based on data mining, the highest herbal compatibility were “ *Curculigo orchioides* - *Epimedium brevicornum*”, and “*Bupleurum chinensis* - dry human placenta - *Cuscuta chinensis* - *Morus alba* - *Epimedium brevicornum* ”. It can be concluded that Dr. Zheng's prescription for the treatment of female infertility in Thailand is based on the TCM treatment path for female infertility to nourish qi and blood, warm and tonify kidney-Yang, regulate Chong and Ren meridians, disperse the liver qi stagnation, promoting blood circulation and remove blood stasis.

7.2 The prescription and compatibility of TTM herbal used for female infertility

Based on the analysis of TTM prescriptions, the most important compatibility in prescriptions were the combination of spicy and hot taste herbs. Based on TTM theory, spicy and hot herbs are mainly used in the rainy season, when the humidity is high and the body is easily exposed to cold and dampness. This might indicate that the prescriptions were mainly used in women with a cold body type. If “wind element type” of herbs are used, it might indicate that most cases of female infertility are among patients that are more than 30 years old; after the age of 30, internal organs begin to lose some function, including the reproductive function. If pungent tasting herbs are used to nourish the fire element in the body, which emphasizes that female infertility is more common in patients with a cold constitution. In addition, pungent tasting herbs are also used to regulate the body’s 4 elements, promoting blood circulation, and regulating the menstrual cycle. The data showed that “neutral nature” herbs had the highest frequency in prescriptions, which emphasize that nourishing the blood was one of the most important treatments.

The analysis of drug associations based on data mining showed the highest herbal compatibility were “*Atractylodes lancea* - *Angelica dahurica*” which is mainly for nourishing

blood, and regulating and nourishing the body's 4 elements. The second important herbal compatibility were "*Piper sarmentosum - Piper interruptum - Zingiber officinale - Piper retrofractum - Plumbago indica*". These spicy and hot nature herbs were called "Benchakun" prescriptions, which mainly regulate the body's wind element, nourish the body's 4 elements, and regulate blood.

Discussion

1. Similarities and differences between TCM and TTM on their therapeutic theories for the treatment of female infertility.

The results show TCM and TTM have the three factors in common that are necessary for conception: patient must have sufficient nourishment from their blood, have a normal menstrual cycle and flow, and have appropriate sexual conditions. Traditional Chinese medicine has two additional factors, which are kidney essence and Qi, and the balance of yin and yang. On the other hand, Thai traditional medicine also includes a healthy condition of the uterus as an important factor.

There are similar principles in both TCM and TTM explaining female infertility. Factors causing female infertility are categorized into congenital factors and the secondary factors. For congenital factors, TCM discusses the 5 abnormalities of the female reproductive system, and TTM points to inherited blood disorders. Traditional Chinese medicine and Thai traditional medicine have common explanations on the secondary factors. For example, lifestyle and environmental factors, including bad diet, lifestyle, excessive emotions, excessive sexual activity, or inappropriate sex conditions. Similar to TCM, which describes exogenous pathogenicity (wind, cold, dampness), TCM also points to woman's age as well as the time of year which can also be important factors.

The disease mechanism: TCM mainly explains "deficiency of kidney and spleen pattern" and "stagnation pattern" that cause deficiency of Qi and blood, the imbalance of Cong and Ren meridians, the stagnation of uterus and uterus meridian, and so on. In TTM, it is mainly explained that the deficiency of blood, irregular menstruation, and blood stasis, blood clot, and the abnormal uterus function were the main mechanism of infertility. The treatment analyzed result showed both TCM and TTM were based on disease mechanisms and a holistic diagnosis pattern, then choose the appropriate treatment option: for the treatment theory we found that period regulation, nourishing blood, regulate and treat uterine diseases, improve the body circulation, and remove the pathological waste were the common treatments, but further treatment theory on TCM were to warm and tonify the kidney-Yang, disperse the liver Qi stagnation, eliminating phlegm and dampness, and TTM mainly regulate the 4 basic body elements, warm the fire element.

2. Similarities and differences between TCM and TTM on their prescription compatibility pattern in the treatment of Thai female infertility.

The data mining results showed 162 unique herbs were used from 223 TCM prescriptions, TCM's most frequency used in the prescription herbs were *Pseudostellaria heterophylla*, *Eucommia ulmoides*, *Epimedium brevicornum*, *Astragalus membranaceus*, *Lycium barbarum*, *Cuscuta chinensis*, *Morus alba*, *Curculigo orchioides*, *Atractylodes macrocephala*, *Glycyrrhiza uralensis*, *Bupleurum chinensis*, Dry human placenta, *Sedum sarmentosum*, *Paeonia lactiflora* (see table 1); TCM's most important compatible prescription herbs were "*Bupleurum chinensis - Dry human placenta, Cuscuta chinensis - Morus alba - Curculigo orchioides - Epimedium brevicornum*" , so the TCM treated Thai female infertility prescription compatibility rules were to nourish Qi and blood, warm and tonify kidney-Yang,

regulate Chong and Ren meridians, disperse the liver Qi stagnation, promoting blood circulation and remove blood stasis; 229 herbal were used from 85 TTM prescriptions, *Piper retrofractum*, *Zingiber officinale*, *Piper nigrum*, *Plumbago indica*, *Piper interruptum*, *Piper sarmentosum*, *Myristica fragrans*, *Angelica dahurica*, *Atractylodes lancea*, *Ligusticum sinense*, *Angelica sinensis*, *Artemisia annua*, *Cuminum cyminum*, *Nigella sativa*, *Foeniculum vulgare*, *Lepidium sativum*, *Syzygium aromaticum*, *Cyperus rotundus*, *Dracaena loureiroi*, *Terminalia chebula* were the most frequently used herbs in the prescription (see table 2); “*Atractylodes lancea* - *Angelica dahurica*”, “*Piper sarmentosum* - *Piper interruptum* - *Zingiber officinale* - *Piper retrofractum* - *Plumbago indica*” were the most compatible found, so TTM prescription compatibility rules were to regulate and nourish the 4 basic body elements, nourish blood, nourish the fire element to eliminate cold inside body, eliminate blood stasis, and treat all other blood disorders .

Conclusion

1. There are similarities between TCM and TTM in their diagnosis and therapeutic approaches to treat female infertility, but there were differences on the explanation of some principles.

2. Traditional Chinese medicine’s and Thai traditional medicine’s diagnosis are based on a holistic view, and most of the Thai female infertility patients had the “cold and deficiency pattern”, then main prescription pattern compatibility of regulate menstrual cycle and flow, nourishing blood, regulate and treat the uterine diseases, improve body circulation, and to remove the blood stasis might be the effective compatible prescription. But there were differences on the specific herbal used that rely on their medicinal theories.

Due to the research on the treatment on female infertility in Thailand is limited, further research is still needed.

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