

Study on Medication Rule and the Syndrome Type of Abnormal Sweating in Diabetes Based on Data Mining

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Abstract

Objective: Based on data mining, to explore the regularity of traditional Chinese medicine (TCM) for diabetic sweating dysfunction (DSD). **Methods:** Searched the clinical literature about treating for DSD in recent 22 years from CNKI, Wan Fang database, VIP database etc. and set up another database. Use the Ancient and Modern Medical Records Cloud Platform to analyze the frequency and correlation of syndrome types, traditional Chinese medicine and other information, and use Gephi to analyze the complex network analysis and visual display, and analyze the main syndrome types, medication frequency, four Qi, five flavors, menstruation, nuclear heart prescription and other medication laws of traditional Chinese medicine in the treatment of abnormal sweating in diabetes. **Results:** Identified 101 studies, involving 166 prescriptions and 163 herbs. The common syndrome types of abnormal sweating in diabetes are Qi Yin deficiency syndrome, yin deficiency internal heat syndrome, lung Wei Qi deficiency syndrome, blood stasis blocking collaterals syndrome, Ying Wei Disharmony Syndrome. The prescription of traditional Chinese medicine has many properties, sweet and flat taste, and it is important to return to the lung and heart meridian. The top five drugs with the highest frequency of use are Astragalus membranaceus, Schisandra chinensis, Rehmannia glutinosa, oyster and licorice. Among them, tonic drugs are used most frequently, followed by heat clearing drugs and astringent drugs. The core prescriptions are Astragalus membranaceus, Schisandra chinensis, oyster, keel, floating wheat, licorice, Rehmannia glutinosa, Ophiopogon japonicus, Angelica sinensis and Atractylodes macrocephala.

1. Introduction

Diabetic sweating dysfunction (DSD) is characterized by profuse sweating in the upper body and, in severe cases, profuse sweating all over the body even in a quiet state [2]. At present, there are limitations in the treatment of DSD in Western medicine, while Chinese medicine has outstanding efficacy in the treatment of DSD. In order to explore the evidence of DSD and the rules of Chinese medicine medication, the author conducted data mining analysis on the clinical research literature of Chinese medicine for the treatment of DSD in the past 22 years and reported as follows.

2. Data and methods

2.1 Retrieval strategy and process

Search scope: CNKI, Wanfang database, CQVIP, and CBM. Retrieved data period: January 1, 2000 - April 30, 2022. Searches: (SU="diabetic sweating abnormalities"

ORSU="diabetes hyperhidrosis" OR SU="sweat syndrome") and (SU="Traditional Chinese medicine" OR

SU="Traditional Chinese medicine"). The retrieved documents were downloaded one by one and duplicates of each database were excluded.

2.2 Inclusion criteria

(1) The subjects of the literature study were human beings, with no restrictions on age and gender; (2) They met the Chinese and Western medical diagnostic criteria for diabetes and DSD[1]; (3) The composition of the drugs was clearly stated in the literature, and the conclusions indicated that their treatment with that drug was effective; (5) The literature contained different prescriptions included in the statistics separately, and only the basic prescription was retained in the same study with the addition and subtraction of drugs to the basic prescription.

2.3 Exclusion criteria

(1) Animal experimental literature; (2) Theoretical discussion, experience summary, review and meta-analysis literature; (3) Study protocols in which the route of administration is intravenous medication or intramuscular injection.

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2.4 Canonical data

The literature was screened according to the inclusion and exclusion criteria and 101 articles with 166 prescriptions were finally included. The prescriptions and symptom types of the included Chinese medicines were entered into the ancient and modern medical case cloud platform, and the data were standardized after the entry was completed, and the names of the Chinese medicines were standardized according to the 2020 edition of the Pharmacopoeia of the People's Republic of China[3]: (1) Those Chinese medicines with similar medicinal effects after concoction were unified as the original names, Licorice Roots Northwest Origin and Honey-fried Licorice Root were unified as licorice, (2) Chinese medicines that have undergone concoction with large differences in efficacy are recorded separately, such as Radix Rehmanniae Radix Rehmanniae Praeparata is unified as rehmannia according to the pharmacopoeia, while Prepared Rehmannia Root is still Prepared Rehmannia Root. (3) Different names due to different origins are unified as the proper name of the drug, Radix Cyathulae and Achyranthes root unified as Radix Achyranthis Bidentatae. The classification of Chinese herbal medicine into the four meridians, Siqu. And Wuwei Theory, and the efficacy was based on the "Thirteenth Five-Year Plan" textbook of the National Health and Family Planning Commission, "Traditional Chinese Medicine". The symptom types were standardized

according to the " Clinic terminology of traditional Chinese medical diagnosis and treatment Syndromes "[4], for example, syndrome of endogenous heat due to yin deficiency and symptom of fire-heat pattern due to Yin deficiency were unified as pattern of insecurity of defensive exterior.

2.5 Data analysis

A total of 163 herbal medicines were included, and 15 herbal medicines were used more than 25% of the time, and the results are shown in Table 2. [5].

3. Result

3.1 Statistical analysis of symptom type

Statistical analysis of the symptom types involved in the 166 prescriptions revealed that the main symptom types involved in abnormal diabetic sweating were: syndrome of deficiency of both qi and yin, Yin deficiency and syndrome of endogenous heat due to yin deficiency, pattern of insecurity of defensive exterior, syndrome of static blood blocking collaterals, syndrome of disharmony between nutrient and defense phases, and syndrome of phlegm-dampness blocking collaterals (frequency ≥ 10). See Table 1.

Table 1. Statistical analysis of common symptom types (frequency ≥ 10)

Statistical analysis of TCM symptom	Frequency	Percentage
syndrome of deficiency of both qi and yin	70	42.17%
pattern of insecurity of defensive exterior	38	22.89%
pattern of insecurity of defensive exterior	28	16.87%
syndrome of static blood blocking collaterals	20	12.05%
syndrome of disharmony between nutrient and defense phases	17	10.24%
syndrome of phlegm-dampness blocking collaterals	13	7.83%

3.2 Statistic analysis of drugs

3.2.1 Analysis of high-frequency drugs

A total of 163 kinds of Chinese medicines were included in the statistics, and the frequency of drug use was 1937

times, frequency (%) = frequency of drug use/number of prescriptions $\times 100\%$, and there were 15 kinds of Chinese medicines that were used more than 25% in the included prescriptions, and the top five flavors were Astragalus, Schisandra, Rehmannia, oyster and licorice, and the results are shown in Table 2.

Table 2. High-frequency Chinese medicine use (frequency $\geq 25\%$)

Statistical Analysis of Chinese Medicines	Frequency	Frequency
Astragalus	119	71.69%
Schisandra	87	52.41%
Rehmannia	86	51.81%
Oyster	81	48.80%
Licorice	73	43.98%

3.2.2 Analysis of drug efficacy categories

The 163 herbal medicines were classified by efficacy, and 9 categories were used more frequently than 20, with the

highest frequency being tonic medicines, as shown in Table 3.

Table 3. Distribution of high-frequency Chinese medicine categories (frequency ≥ 20)

Category of traditional Chinese medicine	Frequency	Major drugs (frequency)
Tonic drugs	678	Qi-tonifying drug 368 Yin-tonifying drug and hemopoietics 310
Heat-clearing drugs	374	Astragalus (119), Licorice (73), Atractylodes sinensis (59), Yam (35) Ophiopogonis (71), Angelica (63), Radix Paeoniae Alba (59), Prepared Rehmannia Root (33) Rehmannia (86), Coptis (47), Scutellaria (42), Cortex Phellodendri (37)
Astringent drug	233	Schisandra (87), Fructus Triticis Levis (65), ephedra root (37), Cornus officinalis meat (32)
Drugs for relieving exterior disorder	136	Radix Saposhnikoviae (43), cassia branch (39), pueraria root (12), Bupleurum bupleurum (10)
Blood-activating and stasis-eliminating compound	91	Radix Salviae miltiorrhizae (24), Ligusticum Chuanxiong (18), Achyranthes bidentata (14), peach kernel (15)
Damp-clearing drug	86	Poria coix (52), Alisma alisma (13), Coix seed (10), talc (4)
Qi-activating drug	28	Fructus aurantii (9), Tangerine peel (9), Chinaberry seed (2), Turpentine (1)
Expectorant	22	Platycodon grandiflorus (6), Rhizoma pinelliae (6), Bamboo Shaver (4), almond (2)

3.3 Analysis of drug association rules

According to the association analysis of traditional Chinese medicine - symptom types, and the frequency of co-occurrence ≥ 9 , confidence ≥ 0.5 and support ≥ 0.05

were selected, and finally 35 association rules data were obtained, and the traditional Chinese medicine was categorized according to symptom evidence type, and the core prescriptions will be obtained. For details, see Table 4.

Table 4. Association analysis between TCM symptom type and Chinese medicine (frequency of co-occurrence ≥ 9)

Chinese medicine symptom type	Main drugs (co-occurrence frequency)
Syndrome of deficiency of both qi and yin	Astragalus membranaceus (60) Radix Ophiopogonis (46) Rehmannia glutinosa (44) Schisandra chinensis (44) oyster (36)
Yin deficiency and syndrome of endogenous heat due to yin deficiency	Rehmannia glutinosa (34) Scutellaria baicalensis (24) Angelica sinensis (23) Coptis chinensis (22) Cortex phellodendri chinensis (21) Astragalus membranaceus (21)
Pattern of insecurity of defensive exterior	Astragalus membranaceus (26) Rhizoma Atractylodis (25) Oyster (19) Fructus Triticis Levis (19) Radix saposhnikoviae (19) Keel (18) Radix paeoniae alba (18) Schisandra chinensis (17) Liquorice (16)
Syndrome of static blood blocking collaterals	Angelica sinensis (15) Astragalus membranaceus (15) Ligusticum wallichii (12) Radix paeoniae rubra (11) Rehmannia glutinosa (10) Safflower carthamus (10) Peach kernel (10)
Syndrome of disharmony between nutrient and defense phases	radix paeoniae alba (17) cassia twig (16) Liquorice (13) Astragalus membranaceus (12) Keel (11) Fructus Triticis Levis (10) Oyster (9) Rhizoma Atractylodis Macrocephalae (9)

4. Discuss

DSD is one of the autonomic neuropathies of diabetes mellitus, with spontaneous sweating or night sweating or partial sweating as the main manifestation, and is

classified as "thirsty sweating", "spontaneous sweating", "night sweating", etc. The frequency statistics show that DSD is most commonly associated with deficiency of both qi and yin. Because of the deficiency of yin in the body of patients with thirst, the prolonged illness will lead

to the depletion of yin and qi, resulting in the deficiency of both qi and yin [6].

The treatment of DSD focuses on the method of benefiting Qi and nourishing Yin. Drug efficacy analysis shows that the drugs used in the treatment of DSD are mostly deficiency tonics, including Qi tonics, blood tonics and Yin tonics. Insufficient Wei Qi will result in the coup d'état and leakage of Yin and fluid. Therefore, it is necessary to tonify qi and consolidate the surface, to strengthen the protection and stop sweating. High-frequency drug analysis also shows that Astragalus is the most commonly used drug, which can greatly nourish the Qi of the spleen and lung and consolidate the surface of the protection. At the same time, sweating is closely related to yin deficiency. If the yin is not enough, then the yang is hyperactive and the yin is driven outward to the couples, causing sweating. Therefore, the treatment also needs to nourish yin and clear heat to stop sweating. The second and third of the HF drugs, Rehmannia and Schisandra, are nourishing yin [7].

At the same time, heat accumulation and phlegm and blood stasis can cause abnormal distribution of fluids, which is the symptom of the disease. Statistics have found that the frequency of heat-clearing, blood-stasis-activating and water-dampness-relieving drugs is second only to qi-supplementing and yin-nourishing drugs. If the heat is strong, the couples will open wide, forcing the fluid to leak out and sweat [8].

At the same time, heat stagnation and phlegm and blood stasis can cause abnormal distribution of fluids, which is the symptom of the disease. Statistics have found that the frequency of heat-clearing, blood-stasis-activating and water-dampness-relieving drugs is second only to qi-supplementing and yin-nourishing drugs. If the heat is strong, the couples will open wide, forcing the fluid to leak out and sweat. Therefore, the high-frequency medicine with Scutellaria baicalensis, Huang Lian and other heat-clearing drugs diarrhea fire and strengthen Yin; phlegm and dampness can also make the distribution of fluid is not normal, depressed in the muscle surface, then sweating. Therefore, high-frequency medicine with Poria cocos, Atractylodes and other dampness-permeating drugs, so that the distribution of fluids normal, the sweating will stop; blood stasis can also be spontaneous sweating, night sweating, blood stasis often block the ligament, so that the distribution of fluids abnormal, overflowing in the muscle surface, and sweating. Wang Qingren in the "Medical Lin Correction" said: "I do not know that blood stasis also causes spontaneous sweating and night sweating, with blood stasis and blood stasis soup." Therefore, the use of angelica, salvia and other blood-stasis invigorating drugs, so that the channels and veins are smooth, fluids through the regulation, sweating will stop. This shows that in the treatment of DSD, we must also identify the symptom to clear heat and cool the blood, resolve phlegm and dispel dampness, and activate the blood to dispel stasis, so that the fluids can spread normally and the sweating will stop [9].

The complex network analysis of Chinese herbs led to the core prescription for the treatment of DSD: Astragalus, Schisandra, oyster, keel, Fructus Tritici Levis, liquorice, Rehmannia, Ophiopogon, Angelica and Atractylodes. The

whole formula can not only benefit Qi and nourish Yin and nourish Blood, but also clear heat and drain actuality, as well as astringent and stop sweating, which is the characteristic of the pathogenesis of DSD, with deficiency of Qi and Yin as the root and , heat stagnation and phlegm and blood stasis as the symptoms [10].

5. Conclusion

In summary, in the treatment of DSD, we should not only pay attention to the essence of Qi and Yin deficiency, benefit Qi and nourish Yin, but also should not ignore the standard of phlegm and heat evil, clear heat and drain the real, a tonic and a clear, a dispersal and a collection, then the body Qi and blood reconciliation, Yin and Yang secret, sweating will stop. Deficiency of both qi and Yin is the most important pathogenesis of abnormal sweating in diabetes. The treatment of this disease is mainly to replenish qi and nourish yin, and the methods of clearing heat, resolving phlegm and dehumidification, activating blood circulation and removing blood stasis, astringent and astringent, resolving exterior and removing pathogenic factors are applied in syndrome differentiation. To sum up, DSD pathogenesis mainly to qi and Yin deficiency can not collect sweat, and heat depression phlegm and stasis make body fluid cloth disorder and sweat does not follow the usual way. Clinical treatment of DSD, should not only pay attention to the qi Yin deficiency, qi nourishing Yin solid table medicine such as astragalus, cooked rehmannia, chinensis, and cannot ignore the phlegm of heat evil stasis, syndrome differentiation to clear heat, removing phlegm and promoting blood stasis, such as heat baicalensis, phelcus chinensis, remove phlegm dampness white surgery, poria cocos, promoting blood circulation of blood stasis medicine miltiorrhiza, red peony root, etc., make the jin fluid road unobstructed, jin fluid cloth is normal. Treatment on a clear, a scattered a close, make the human body qi and blood harmony, Yin Pingyang secret, sweat since stop.

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