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Original Article

Association of traditional Chinese medicine body constitution with chronic diseases

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Abstract: Objective: (1) To delve into the association of traditional Chinese medicine (TCM) constitution types and chronic diseases by assessing the TCM constitution of 926 in-patients with type 2 diabetes, hypertension or osteoarthrosis, and (2) To evaluate the assessment of TCM constitution and health guidance under the TCM theory in blood glucose control and blood lipid regulation in 116 type 2 diabetes patients. Methods: (1) From May 2014 to October 2017, 926 patients with type 2 diabetes, hypertension, or osteoarthritis hospitalized in Karamay Municipal People's Hospital were enrolled and assessed for investigating the correlation between their TCM constitution and the above-listed chronic diseases. (2) Type 2 diabetes patients admitted to Karamay Municipal People's Hospital from May 2014 to December 2016 were enrolled. They were assessed for their TCM constitution by professional software. Two hundred and sixteen yin-deficiency patients with type 2 diabetes were randomly divided into the intervention group (n=116) and control group (n=100). Patients in the intervention group were intervened with routine basic treatment plus TCM health guidance, while those in the control group received routine basic treatment alone. Regulation of blood glucose and blood lipid levels was compared between the two groups and relevant statistical analyses were made. Results: (1) TCM constitution of 926 in-patients with above chronic diseases was confirmed. Yin deficiency, yang deficiency and phlegm dampness were the three most common imbalanced constitutions among the diabetes cases, among which yin deficiency took up the greatest proportion of 39.74%. The common imbalanced constitutions in hypertensive patients were yang deficiency, yin deficiency, qi deficiency and phlegm dampness. Among them, yang deficiency (18.80%) and yin deficiency (18.42%) were the most common types. For the assessed osteoarthrosic patients, yang deficiency, blood stasis and phlegm dampness were the three most common types. Yang deficiency that accounted for 24.36% and blood stasis 16.94% were the two greater proportions. (2) Distribution of TCM constitutions in Han and Uighur patients with diabetes, hypertension or osteoarthritis varied. Yin-deficiency Han and Uighur patients were at high risk for diabetes. Han patients with yang-deficiency or yin-deficiency, and Uighur patients with phlegm-damp were at high-risk for hypertension. Yang-deficiency Han and Uighur patients were at high risk for osteoarthritis. (3) The 116 patients with type 2 diabetes were observed significantly lower levels of serum cholesterol, triglyceride, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and glycosylated hemoglobin after intervention than those before intervention and those of the patients in the control group after intervention (all $P<0.05$). Conclusion: (1) Among imbalanced constitutions, yin-deficiency, yang-deficiency and phlegm-dampness were found most associated with type 2 diabetes. Blood-stasis and yang-deficiency were also susceptible to diabetes. Yang deficiency and qi deficiency were susceptible to hypertension. Osteoarthrosis may occur if the patient was either of yang-deficiency or blood-stasis. (2) Intervention guided by TCM theory on the basis of TCM constitution determination is effective for prevention and treatment of type II diabetes, resulting in better control of blood glucose and blood lipid levels.

Keywords: Traditional Chinese medicine constitution determination, traditional Chinese medicine health guidance, diabetes, hypertension, osteoarthritis

Introduction

With the development of society and economy, improvement of living standards, changes of life style, and aging of the population, chronic non-infectious diseases have badly jeopardized patients' quality of life and life safety, and add burden to the society. We should make better use of the roles of traditional Chinese medicine (TCM) theory of "preventing disease from occurrence, preventing disease from exacerbation, and preventing disease from relapse after

recovery" in the field of prevention and treatment of chronic diseases to prevent long-term hazards of chronic diseases and presence of severe complications. Therefore, in this study, according to the classification and determination of constitution in TCM released by the China Association of Chinese Medicine, 926 in-patients with chronic diseases were determined for TCM constitution, and a health management information system featuring TCM was established. Health care intervention guided by TCM theory was performed for diabetic patients based on TCM constitution determination. The roles of the intervention program in regulating blood glucose and blood lipid levels and improving the treatment effect were assessed in such patients [1].

Materials and methods

General data

From May 2014 to October 2017, 926 patients with chronic diseases admitted to Karamay Municipal People's Hospital (Departments of Traditional Chinese Medicine, Orthopedics, Internal Medicine, and Endocrinology) were investigated for TCM constitution. Among them, 431 patients had osteoarthritis, 266 had hypertension and 229 diabetes. There are 455 males and 471 females in total; 486 were Han patients and 440 were Uighur ones. They ranged in age from 30 to 85 years (mean, 52.77± 8.89 years).

Criteria for classification and determination of TCM constitution

Patient constitutions were determined according to the standardized constitution in Chinese medicine questionnaire derived from the classification and determination of constitution in TCM released by the China Association of Chinese Medicine. The questionnaire is a self-evaluation scale composed of 9 subscales, including nine constitution types of normal constitution, qi deficiency, qi stagnation, yang deficiency, yin deficiency, blood stasis, phlegm dampness, damp-heat, and special constitution. In each item of the scale, the patients were required to select the answers most suitable for their own conditions from the five options (Never, Occasionally, Sometimes, Often, and Always) of the Likert Scale (1.5). Each item was scored by a 5-point method (1 to 5). After revenant data for the 61 items were input into the computer, patient constitution types were automatically determined by the computer system, and the results were normal constitution, or other 8 imbalanced or composite constitutions [1, 2].

Methods

Questionnaire establishment: A questionnaire was prepared to investigate general data (name, gender, age, ethnicity, personal history of disease, family history of disease), clinically biochemical markers and results of TCM constitution determination of patients.

TCM constitution determination

On-site surveys were conducted by specifically-trained attending physicians or resident doctors. They asked the investigated patients to complete the questionnaires and diagnosed them by the four TCM diagnostic methods (pulse and tongue diagnosis, auscultation and constitution classification in TCM). They input the collected patient data into a software system for TCM constitution determination. Constitution types of patients were determined by the database. Patients were informed of specific individual constitution types and provided corresponding TCM health guidance.

Establishment study groups of type 2 diabetes patients

Patients with type 2 diabetes in the intervention group were assessed for TCM constitutions using the TCM constitution determination software and intervened with TCM health guidance plus routine basic treatment. Those in the control group received routine basic treatment alone. The 116 diabetes in-patients with yin deficiency were intervened with individualized TCM health guidance. There were 30 days in a course of treatment. After three consecutive 30-day courses, (fasting, postprandial) blood glucose and lipid levels were compared before and after intervention, and the results of TCM intervention were obtained.

TCM health guidance

According to constitution types of patients, a variety of strategies were developed, including dietetic regulation, daily-life regulation, psychological intervention, exercise regulation, drug

intervention and acupoint health care, and brochures for different constitutional types were distributed. The intervention strategies in TCM for yin-deficiency patients were as follows: A) Dietetic regulation: Most were light-flavored and bland foods, such as lilium brownii, tremella fuciformis, lotus seed, bird's nest, corn stigma and black sesame. These foods have effects of nourishing yin, generating body fluid and moistening dryness. B) Daily-life regulation: Patients should live in a quiet environment and keep early hours. They should also take a nap for 15-20 minutes. C) Psychological intervention: Patients should paint and practice calligraphy in a quiet environment, and listen to soft and soothing music rather than jazz and loud music and pop dance. D) Exercise regulation: Patients should avoid activity in a high-temperature environment and prevent profuse and excessive sweating, and can take low-intensity aerobic exercise or Tai Chi. E) Drug intervention: Drugs with the effects of tonifying liver and kidney, nourishing yin and clearing heat can be taken, such as cornus officinalis, glossy privet fruit, eclipta prostrata, schisandra chinensis, fructus lycii, ophiopogon japonicu, polygonatum sibiricum polygonatum odoratum and asparagus cochinchinensis. The commonly-used prescriptions included Liuwei Dihuang Pills and Large Yin-Nourishing Pills. Patients could take Baihe Gujin Decoction for intervention of yin deficiency of lung, and Tianwang Buxin Pills for intervention of yin deficiency of heart. Yiguan Decoction was appropriate for patients with yin deficiency of liver, while Liuwei Dihuang Pills are appropriate for patients with deficiency of kidney yin. F) Selection of acupoints: Acupoints Taixi and Sanyinjiao on the kidney meridian were massaged gently in a rotary way until the patient felt sore and swollen in the acupoint. Each acupoint was massaged for 2-3 min (once or twice per day).

Outcome measures

Outcomes included rules of distribution of nine TCM constitution types in patients with diabetes, hypertension, or osteoarthritis; rules of distribution of nine constitution types in diabetic, hypertensive or osteoarthritic patients with Han or Uighur ethnic origins; comparisons of blood glucose and blood lipid levels among 116 diabetes patients before and after 3 courses of TCM health intervention.

Statistical analysis

Statistical analyses were performed using SPSS statistical software, version 17.0. Descriptive analysis was made for general data. Measurement data were expressed as mean ± standard deviation; paired t-tests were applied for intragroup comparisons; independent samples T-tests were employed for between-group comparisons at the same time points. Count data were compared by Chi-square test. Significance level was set as $\alpha=0.05$, and $P<0.05$ was statistically significantly different.

Results

Constitution distribution of diabetic patients with different ethnic origins

Table 1 shows the survey of TCM constitutions in 229 cases of diabetes which indicated that yin deficiency, yang deficiency and phlegm dampness were more common constitution types in diabetic patients, and yin deficiency was the most common (39.27%). Patients with different imbalanced constitutions were ordered from high to low in terms of the risks for diabeticss: yin deficiency > yang deficiency > phlegm-dampness > qi deficiency. There was significant difference among yin deficiency and other constitution types ($P<0.05$); yin-deficiency patients accounted for 40% of all the diabetic patients. The proportion of yin-deficiency patients with diabetes was significantly larger than that of diabetic yang-deficiency ones ($P<0.001$), indicating that yin-deficiency patients were at highest risk for diabetes. The common constitutions were different between Han and Uighur diabetic patients. Yin deficiency Han patient accounted for the greatest proportion (43.9%). Phlegm dampness patients took up the second largest proportion (27.69%) of diabetic patients in Uighur ethnic group (only followed by those with yin deficiency), 9.76% higher than that of Han patients ($\chi^2=11.885$, $P=0.001$), suggesting that different ethnic origins are important factors in forming different constitutions. The study suggested that yin-deficiency patients were at high risk for diabetes, and yin-deficiency Han patients and phlegm-damp Uighur patients were at high risk for diabetes, providing scientific evidence for conducting "preventive treatment of disease" to prevent occurrence and development of diabetes.

Table 1. Constitution distribution of diabetic patients with different ethnic origins

Constitution	Han patients		Uighur patients		Total frequency	
	Frequency	Rate	Frequency	Rate	Frequency	Rate
Normal	12	7.32%	1	1.54%	13	5.68%
Qi deficiency	18	10.98%	7	10.77%	25	10.92%
Qi stagnation	9	5.49%	3	4.61%	12	5.24%
Phlegm dampness	16	9.76%	18	27.69%*	34	14.85%
Yang deficiency	24	14.63%	13	20.00%	37	16.16%
Yin deficiency	72	43.9%	19	29.23%$^{\Delta}$	91#	39.74%
Blood stasis	5	3.05%	3	4.61%	8	3.49%
Damp-heat	8	4.88%	1	1.54%	9	3.93%
Special	0	0%	0	0%	0	0%

Note: Compared with Han patients with phlegm dampness, *P=0.001; compared with Han patients with yin deficiency constitution, $^{\Delta}\chi^2$=4.184, P=0.041; compared with other constitutions, #P<0.05.

Table 2. Constitution distribution of hypertensive patients (different ethnic origins)

Constitution	Han patients		Uighur patients		Total frequency	
	Frequency	Rate	Frequency	Rate	Frequency	Rate
Normal	18	11.18%	11	10.09%	29	10.90%
Qi deficiency	22	13.66%	22	20.18%	44	16.54%
Qi stagnation	13	8.07%	7	6.42%	20	7.52%
Phlegm dampness	16	9.93%	27	24.77%*	43	16.17%
Yang deficiency	32	19.87%	18	16.51%	50	18.80%
Yin deficiency	32	19.87%	17	15.66%	49	18.42%
Blood stasis	14	8.69%	6	5.5%	20	7.52%
Damp-heat	8	4.96%	1	0.92%	9	3.38%
Special	2	1.24%	0	0%	2	0.75%

Note: Compared with phlegm-damp Han patients, *P=0.001.

Constitution distribution of hypertensive patients with different ethnic origins

Table 2 indicates that 266 hypertensive patients were investigated for TCM constitution, and the common constitution types for hypertension were yang deficiency, qi deficiency, yin deficiency, phlegm-dampness. Patients with different imbalanced constitutions were ordered from high to low in terms of the risks for hypertension: yang deficiency > yin deficiency > qi deficiency > phlegm dampness, indicating that the four constitutions are high-risk constitutions for hypertension. Hypertensive Han and Uighur patients had basically same constitution types. Greater proportions of Han patients with hypertension had yang-deficiency or yin-deficiency, while patients with phlegm dampness took up the greatest proportion (24.77%) of hypertensive Uighur patients, which was significantly higher than 9.93% of Han patients (χ^2=10.091, P=0.001), implying that different ethnic origins were crucial factors for development of different constitutions. The study suggested that: yang deficiency, yin deficiency, qi deficiency, and phlegm dampness were high-risk constitutions for hypertension. Han patients with yang deficiency or yin-deficiency, and Uyghur patients with phlegm dampness were at high-risk for hypertension. This provided a scientific basis for conducting "treatment in accordance with patient individuality" to prevent occurrence and development of hypertension.

Constitution distribution of osteoarthritic patients with different ethnic origins

Table 3 demonstrates the investigation of TCM constitution in 431 patients with osteoarthritis: Yang deficiency, blood stasis, phlegm dampness, and qi deficiency were common constitutions for osteoarthrosis, and yang deficiency was the most frequent. Patients with different imbalanced constitutions were ordered from

Table 3. Constitution distribution of osteoarthritic patients (different ethnic origins)

Constitution	Han patients		Uighur patients		Total frequency	
	Frequency	Rate	Frequency	Rate	Frequency	Rate
Normal	18	10.65%	26	9.92%	44	10.21%
Qi deficiency	20	11.83%	37	14.12%	57	13.23%
Qi stagnation	19	11.24%	11	4.19%	30	6.96%
Phlegm dampness	18	10.65%	54	20.61%*	72	16.71%
Yang deficiency	47	27.81%	58	22.13%	105	24.36%
Yin deficiency	19	11.24%	23	8.77%	42	9.74%
Blood stasis	21	12.42%	52	19.84%	73	16.94%
Damp-heat	1	0.59%	3	1.14%	4	0.93%
Special	2	1.18%	2	0.76%	4	0.93%

Note: Compared with phlegm-damp Han patients, *P=0.011.

Table 4. Fasting and 2-hour postprandial blood glucose levels in both groups before and after treatment

Marker	Time	Intervention group (116)	Control group (100)	t	P
Fasting	Before treatment	8.3±1.2	8.5±1.6	1.047	0.296
	After treatment	6.6±1.1*,#	8.2±1.4*	9.397	<0.001
t		18.247	9.274		
P		<0.001	<0.001		
Postprandial	Before treatment	12.5±2.1	13.1±2.9	1.757	0.080
	After treatment	8.2±1.5*,#	8.9±1.6*	3.316	0.001
t		13.816	21.192		
P		<0.001	<0.001		

Note: Compared to fasting or prandial 2-hour blood glucose levels before treatment in the same group, *P<0.001; compared with fasting or 2-hour postprandial blood glucose levels after treatment in the control group, #P<0.001.

high to low in terms of the risks for osteoarthrosis: yang deficiency > blood stasis > phlegm dampness > qi deficiency, which indicated that patients with any of the four constitutions were at high risk for osteoarthrosis. The frequent constitution types were generally similar in Han and Uighur patients with osteoarthrosis, and yang deficiency was most frequent. In Uighur ethnic group, the proportion (20.61%) of phlegm-damp patients with osteoarthrosis was second only to that of yang-deficiency patients with osteoarthrosis, significantly higher than that (10.65%) of phlegm-damp patients with osteoarthrosis in Han ethnic group (χ^2=6.455, P=0.011), implying that different ethnic origins were important factors for development of different constitutions. The study suggested that: yang-deficiency patients were at highest risk for osteoarthrosis, and Han or Uighur patients with yang deficiency were at high-risk for osteoarthrosis, providing a scientific basis for preventing presence and development of osteoarthrosis.

After the investigation on constitutions of patients with chronic diseases, the rules and features of TCM constitution distribution in patients with chronic diseases in Han and Uighur ethnic groups were concluded. The rules for distribution of TCM constitution in patients with diabetes, hypertension, and osteoarthritis in Han and Uighur ethnic groups were not the same. The features were: yin-deficiency Han patients and phlegm-damp Uighur patients were at high-risk for diabetes; yang-deficiency or yin-deficiency Han patients, and phlegm-damp Uighur patients were high-risk population for hypertension; Han and Uighur patients with yang deficiency were at high-risk for osteoarthrosis. For the three chronic diseases, the rates (27.69%, 24.77%, and 20.61%) of phlegm-damp Uighur patients were significantly higher than those (9.76%, 9.93% and 10.65%; P<0.05) of Han patients. Patients with phlegm dampness were also susceptible to osteoarthrosis, hypertension, and diabetes.

Fasting and 2-hour postprandial blood glucose levels in the two groups before and after treatment

Table 4 illustrates that there was no significant difference in fasting and 2-hour postprandial blood glucose levels between the two groups

Table 5. Blood lipid levels before and after treatment (mmol/L)

Group	Case	Time	Cholesterol	Triglyceride	LDL	HDL
Intervention group	116	Before treatment	5.75±1.31	1.84±0.79	2.93±0.85	1.08±0.27
		After treatment	4.22±0.91*,#	1.41±0.72*,#	2.31±0.74*,#	1.33±0.30*,#
Control group	100	Before treatment	5.83±1.07	1.73±0.63	2.95±0.83	1.07±0.31
		After treatment	4.55±1.03*	1.64±0.81*	2.56±0.78*	1.17±0.35*

Note: LDL, low-density lipoprotein; HDL high-density lipoprotein. Compared with the same group before treatment, *P<0.001; compared with the control group after treatment, #P<0.05.

before treatment (all P<0.05). Fasting and 2-hour postprandial blood glucose levels after treatment were lower than before treatment in the intervention and control groups. The fasting and 2-hour postprandial blood glucose levels in the intervention group after treatment were significantly lower than that in the control group (both P<0.05).

Blood lipid levels before and after treatment in both groups

Table 5 describes that the differences in blood lipid levels before treatment were statistically insignificant between the two groups (all P>0.05). After treatment, the levels of cholesterol, triglyceride, and LDL in both groups were significantly lower than before treatment, and the HDL levels were higher (all P<0.001). Cholesterol (t=2.500, P=0.013), triglyceride (t=2.209, P=0.028), and LDL levels (t=2.415, P=0.017) in the intervention group were significantly lower than those in the control group, but the HDL level was significantly higher than that in the control group (t=3.618, P<0.001).

Discussion

Constitution is a special state of metabolism, functions and structure formed by individuals in the communities during their growth and development. This specialty often determines individual's susceptibility to certain pathogenic factor and tendency to the resultant lesion type [3-5]. The idea of adjustable constitution confirms that constitution is relatively stable and variable [6, 7]. In our study, we found that after TCM constitution determination and TCM health guidance, regulation of blood glucose and lipid levels in diabetic patients was significantly better than that of the control group, providing evidence for improving constitution and recovering the constitution state of affected individuals [8, 9].

Clinically, multiple trials have been involved in TCM constitution determination in patients with diabetes, hypertension, or osteoarthrosis. Some scholars have investigated the TCM constitution of diabetic patients and stated that the common constitution types in diabetic patients included phlegm dampness, yin deficiency, blood stasis, damp-heat and qi deficiency, and phlegm dampness and yin deficiency account for 80% [10, 11]. The current study showed that the main constitution types of diabetic patients were yin deficiency and phlegm dampness, which is consistent with the results of modern research and the argument that diabetes is associated with abnormality of natural endowment derived from the book, Yellow Emperor's Classic of Internal Medicine. Some studies have pointed out that constitution is closely associated with obesity, blood lipid levels, and coagulation-related markers in diabetic patients [12-14]. Elevated levels of cholesterol and triglycerides are independent risk factors of phlegm dampness, and blood stasis is positively correlated with the family history of diabetes. People with a family history of diabetes and blood stasis are at higher risk of developing macrovascular and microvascular lesions. From the perspective of the TCM constitution theory, routine medical treatment and health care have been carried out for prevention and treatment of diabetes. Some studies have proved that conventional medical treatment and health interventions on the basis of TCM constitution result in decreased levels of blood glucose, triglyceride, cholesterol and other markers in diabetic patients [15]. Another study reported that dietary, exercise, and psychological guidance based on TCM constitution significantly improved the patient's condition [16]. The results of this study suggested that compared with the control group, the intervention group had significantly lower fasting and 2-hour postprandial blood glucose and lipid levels. This indicated that TCM health intervention

based on TEM constitution determination led to more effective control of patient blood glucose and lipid levels, better regulation of type 2 diabetes, and delay in progression of diabetes.

Numerous studies have demonstrated that healthy people with yin deficiency, qi deficiency or phlegm dampness are most susceptible to hypertension [17, 18]. The causes are as follows: Firstly, congenital deficiency or deficient kidney and old age result in deficiency of liver and kidney, deficiency of kidney essence, kidney failing to nourish liver, as well as yin deficiency and yang hyperactivity, hence developing disease. Secondly, the organs in the body appear signs of qi deficiency. Thirdly, dietary disorder and improper diet damage spleen and stomach, resulting in deficiency of spleen and stomach, nephrogenic edema, and phlegm dampness affecting the superior part of body, hence developing disease. Prevention and treatment of hypertension should follow the theory of "preventive treatment of disease" in TCM, namely, active control of risk factors for hypertension before disease onset, improvement of unhealthy lifestyles including smoking quitting, alcohol abstinence, low-salt and low-fat diet, and proper exercise, regular monitoring of blood pressure, early intervention after presence of disease, regular medication to prevent damage to the target organs (heart, brain, kidney), and adherence to medication after disease stability to prevent its recurrence.

A study on TCM constitution in patients with cervical spondylosis indicated that the occurrence of cervical spondylosis may be associated with special constitution types, primarily with yang deficiency, blood stasis, phlegm dampness, and other imbalanced constitutions [19]. Another study investigating TCM constitution in elderly population revealed that with the increase in the detection rate of qi deficiency, yang deficiency, phlegm dampness, and blood stasis, the prevalence of chronic low back pain also increases, namely, pathogenesis of qi deficiency, yang deficiency, phlegm dampness, and blood stasis was significantly associated with the prevalence of chronic low back pain in the elderly [20]. The results of the present study support this theoretical conclusion, further demonstrating the idea of "different constitution types determine the susceptibility of individuals to specific etiology and disease, and tendency of pathological processes" [21].

Targeted TCM interventions on the basis of TCM constitution determination can help patients with chronic diseases (hypertension and diabetes) to determine constitution, enhance awareness of TCM health care, choose correct interventions to improve their constitution, effectively control blood pressure, lipid and glucose levels, delay progression of disease, improve quality of life, and reduce the burden on the family of the patients and of society.

The subjects of the present study were patients with chronic diseases admitted to Karamay Municipal People's Hospital. However, the facts that this study was not a multicenter trial and that the sample size was small might cause errors in its results. In future research, epidemiological studies with larger sample size are required to ensure the accuracy of the study conclusions. Additionally, the correlations between TCM constitution and complications of hypertension and diabetes needs further study.

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Disclosure of conflict of interest

None.

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