Clinical research linking Traditional Chinese Medicine constitution types with diseases: a literature review of 1639 observational studies


Abstract

OBJECTIVE: To analyze clinical studies on correlations between Traditional Chinese Medicine (TCM) body constitution types and diseases published in the past 10 years, and to provide an evidence base to support the use of such correlations for health maintenance and disease prevention.

METHODS: We searched five databases for the period April 2009 to December 2019: China National Knowledge Infrastructure Database, Wanfang Database, China Science and Technology Journal Database, PubMed and Embase. Three types of observational studies on correlation between constitution types and diseases were included: cross-sectional, case-control and cohort studies. Descriptive statistical methods were employed for data analysis.

RESULTS: A total of 1639 clinical studies were identified: 1452 (88.59%) cross-sectional studies, 115 (7.02%) case-control studies and 72 (4.39%) cohort studies covering 30 regions of China and five other countries (Malaysia, South Korea, Singapore, Thailand and France). The collection of studies comprised 19 disease categories and 333 different diseases. The 10 most commonly studied diseases were hypertension, diabetes, stroke, coronary atherosclerotic heart disease (CAHD), sleep disorders, neoplasm of the breast, dysmenorrhea, fatty liver disease, chronic viral hepatitis B and dyslipidemia. We found high distributions for each biased constitution type in different patient populations as follows: Qi-deficiency constitution in stroke, diabetes, chronic obstructive pulmonary disease, acquired immunodeficiency syndrome and hypertension; Yang-deficiency constitution in female infertility, osteoporosis, irritable bowel syndrome, gonarthrosis and dysmenorrhea; Yin-deficiency constitution in hypertension, diabetes, constipation, female climacteric states and osteoporosis; phlegm-dampness constitution in hypertension, stroke, fatty liver disease, diabetes and metabolic syndrome; damp-heat constitution in acne, chronic gastritis, chronic viral hepatitis B, human papillomavirus in-
fection and hyperuricemia; blood-stasis constitution in CAHD, endometriosis and stroke; Qi-stagnation constitution in hyperplasia and neoplasms of the breast, insomnia, depression and thyroid nodules; and inherited-special constitution in asthma and allergic rhinitis.

CONCLUSION: Eight biased TCM constitutions were closely related to specific diseases, and could be used to guide individualized prevention and treatment. More rigorously designed studies are recommended to further verify the constitution-disease relationship.

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Keywords: Body constitution; Medicine, Chinese traditional; Clinical study; Review

INTRODUCTION

The connection between an individual’s constitution, or body type, and disease is a key concept in traditional Chinese Medicine (TCM) theory. Different constitution types have different disease susceptibilities and tendencies, with the constitution often considered as the ‘background’ and the disease as the ‘foreground’. Body constitution is the internal basis for the occurrence, development, transformability and prognosis of diseases.

People can be divided into nine types based on Classification and Determination of Constitution in TCM, which was published by the China Association of Chinese Medicine (CACM) in April 2009 and is considered the professional standard: balanced constitution (BC), Qi-deficiency constitution (QDC), Yang-deficiency constitution (YADC), Yin-deficiency constitution (YIDC), phlegm-dampness constitution (PDC), damp-heat constitution (DHIC), blood-stasis constitution (BSC), Qi-stagnation constitution (QSC) and inherited-special constitution (ISC). Using this standard, the number of clinical studies focused on the constitution-disease relationship has grown rapidly in the past decade. These studies have had great value in promoting the individualized diagnosis, prevention and treatment of diseases. However, there have been few reports describing bibliometric methods to examine these recent literature.

Previous bibliometric research focused on the overall field of TCM constitution, but lacked in-depth insight on the constitution-disease relationship. Furthermore, literature reviews on the correlation between constitution types and diseases mostly adopted a traditional narrative review method, which enumerated only some research results; focused on correlations between a single constitution type and diseases; or described the constitution characteristics of a specific disease. Therefore, in this study we aimed to summarize all available clinical evidence of the relationship between constitution types and diseases, explore the value of this evidence for clinical practice, and identify priorities for further study.

METHODS

Data source and search strategy

We conducted searches in the China National Knowledge Infrastructure Database (CNKI), Wanfang Database, China Science and Technology Journal Database (CQVIP), PubMed and Embase database from April 2009 to December 2019. The search terms included ‘constitution’, ‘physique’, ‘Chinese medicine’, ‘classification and determination of constitution in TCM’, and ‘Chinese medicine constitution scale’ in Chinese or English. As an example, the search terms for PubMed were as follows: "(constitution [Title/Abstract] OR physique [Title/Abstract] AND 'Chinese medicine' [All fields] AND 'classification and determination of constitution in TCM' [All fields]) AND (2009/04/01 [PDAT] : '2019/12/31' [PDAT])". Two authors imported retrieval results into NoteExpress (Version 3.2.0.7253; Beijing Aegean Technology Corporation Limited; http://www.noteexpress.com/aegean/) and eliminated duplicate records. They screened the titles and abstracts of the search results to exclude obviously irrelevant literature, and reviewed full papers to determine all eligible clinical studies according to inclusion/exclusion criteria. If there was any uncertainty or discrepancy, a third author was consulted.

Selection criteria

Observational studies were included, with no restrictions on language of publication, according to the following criteria: (a) subjects of the studies were patients with an existing diagnosis, or were screened from a general population, and clear diagnostic criteria were reported; (b) the tool used for constitution determination was Classification and Determination of Constitution in TCM (ZZYXH/T 157-2009); and (c) studies reported the proportion of each constitution type, or the constitution type that was mainly studied in the disease population.

Studies were excluded for any of the following reasons: (a) there was no way to distinguish the constitution distribution in healthy participants or the disease population; (b) reports lacked demographic data of the study subjects or basic information regarding the determination of constitution; or (c) identification of duplicate studies, for which we included the most comprehensive study, with the order of priority of dissertation > journal paper > conference paper.

Data extraction

We designed a structured data extraction form which consisted of the following sections: (a) publication in-
Statistical analysis
Descriptive statistical methods were employed for data analysis. Results are presented as frequency, percentage, median and tendency.

RESULTS
Selected studies
We identified 5491 references, of which 3852 reports were excluded after eliminating duplicate records, screening titles and abstracts, and reviewing the full text according to inclusion/exclusion criteria. Finally, 1639 reports were included in the analysis (Figure 1).

Bibliometric characteristics of included studies
The number of clinical studies describing correlations

Figure 1 Flow diagram of literature searches and study selection
CNKI: China National Knowledge Infrastructure Database; VIP: China Science and Technology Journal Database; TCM: Traditional Chinese Medicine.
between constitution types and diseases grew from 16 in 2009 to 198 in 2019, an increase of 11.38-fold. The average annual growth rate was 28.60%. The numbers of articles peaked in 2016, fell slightly in 2017, and continued to grow in 2018 and 2019. Due to a time lag in document inclusion in the databases, some studies that were published in 2019 were not identified by our search (Figure 2).

Among the 1639 studies, 1619 (98.78%) were published in Chinese and 20 (1.22%) in English, 17 of which were published in journals included in Science Citation Index (SCI). The first clinical study that appeared in SCI was published in 2010. In the past 4 years (2016-2019), the number of relevant papers published in English was 3, 6, 4 and 3, respectively, accounting for 80.00% of all of the English literature search results.

According to the regional distribution of first authors, relevant research was carried out in 30 regions of China; exceptions were Qinghai, Tibet, Hong Kong and Macao (Figure 3). There was also one author from Malaysia. Guangdong, Beijing and Shandong produced the most papers, the sum of which accounted for 40.76% of the total literature. There were 1630 studies conducted in China, and nine studies conducted abroad, in countries including Malaysia, South Korea, Singapore, France and Thailand.

The types of research institutions included colleges, universities, hospitals, scientific research institutes, grassroots medical institutions, and centers for disease control and prevention (Figure 4). Among the 1639 studies, 918 studies were conducted by universities or colleges, and 650 by hospitals, which together accounted for 95.67% of the total. The top 15 institutional producers of studies were all universities.

In terms of publication types, 886 (54.06%) were journal papers, 710 (43.32%) were dissertations, and 43 (2.62%) were conference papers (Figure 5). All 710 dissertations originated from 44 universities or scientific research institutes in China, comprising 35 doctoral dissertations and 675 master’s degree dissertations. The top 3 producers of dissertations were Guangzhou University of Chinese Medicine (18.73%), Beijing University of Chinese Medicine (13.80%) and Shandong University of Chinese Medicine (9.44%) (Table 1). Two Chinese journals published more than 20 papers each on correlation between constitution types and diseases: Journal of New Chinese Medicine (34 papers) and China Journal of Traditional Chinese Medicine and Pharmacy (31 papers). The 20 English papers were published in 11 academic journals. The top 3 SCI-indexed journals in terms of numbers of papers were all authoritative international titles in complementary and alternative medicine: Evidence-based Complementary and Alternative Medicine (5 papers), Chinese Journal of Integrative Medicine (3 papers) and Complementary Therapies in Medicine (3 papers).

There were 4615 authors of the 1639 articles included in our analysis. The top 3 authors in terms of numbers of published clinical research papers on correlation between TCM constitution types and diseases were Luo Ren (10 papers) from Southern Medical University, and Wang Qi (10 papers) and Zhu Yanbo (8 papers) from Beijing University of Chinese Medicine.

Regarding sponsorship of the 526 academic journal papers published in the past 4 years (2016-2019), 342 received funding, accounting for 65.02%.

### Basic characteristics and design types of the clinical studies

The total sample size of the 1639 clinical research publications was 954,744 cases. The maximum sample size was 1,214,972; the minimum sample size was 22; the average sample size was 582.87, and the median was 220.50.

The clinical studies comprised 1,452 (88.59%) cross-sectional studies, 115 (7.02%) case-control studies, and 72 (4.39%) cohort studies (Figure 6). Of the 1,452 cross-sectional studies, 1,085 (74.72%) only included a disease population, while the remaining 367 (25.28%) included a healthy control group to compare proportional differences in constitution types between the two populations.

There were two main sources of study subjects: (a) spe-

![Figure 2 Publication trends of clinical studies on correlation between Traditional Chinese Medicine constitution types and diseases from 2009 to 2019](image-url)
Figure 3 Regional distribution of clinical studies on correlation between Traditional Chinese Medicine constitution types and diseases in China.

Figure 4 Proportion of clinical studies (n, %) on correlation between Traditional Chinese Medicine constitution types and diseases according to the type of originating institution.

- College and university
- Hospital
- Grassroots medical institution
- Scientific research institute
- Center for disease control and prevention
- Other
cific disease patient populations identified in the course of medical treatment or health check-up (1422, 86.76%); and (b) community-based general populations (211, 12.87%). The authors of two included papers did not report the source of their subjects, and 4 papers included both hospital- and community-based populations in the same study.

Regarding the research content, both cross-sectional and case-control studies all reported the proportion of TCM constitution types in different diseases. Some cross-sectional studies further explored correlation between constitution types and clinical parameters. Case-control studies compared the proportional differences in constitution types between the case and control groups. We divided the research content of the 72 cohort studies into five categories. The first category was the largest, comprising 42 studies that probed the relationships between constitution, prognosis and transformation of diseases. As an example, one study observed the relationship between the quality of life of older patients with cancer and constitution type.23 In the second category were 17 studies that reported the relationship between regulation of constitution and therapeutic effects on diseases. For example, one study com-
We extracted the highest proportions of constitution types reported in each publication to generate descriptive statistics. For a given disease, the larger the number of studies and sample sizes, the stronger the likelihood that a particular constitution actually accounted for the highest proportional type in that disease population. Because the BC type is considered a protective factor against disease, we did not describe the disease spectrum distribution of BC in this analysis. QDC was the most common constitution type among patients with 119 different diseases in 340 clinical studies. Of those 119 diseases, 54 were associated with QDC in ≥2 studies.

Figure 7 Disease categories included in the clinical studies on correlation between Traditional Chinese Medicine constitution types and diseases, classified according to International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) system.

**Distribution of disease spectrum of various constitution types**

We extracted the highest proportions of constitution types in the 20 categories of disease in ICD-10, the 1639 studies included in our clinical studies. There were 333 diseases included in the 1639 clinical studies. 84 diseases were studied in more than 5 publications, and 38 diseases were studied in more than 10 publications (Figure 8).

**Disease types included in the studies**

Among the 20 categories of disease in ICD-10, the 1639 studies included all categories except for one (congenital malformations, deformations, and chromosomal abnormalities). The top 5 disease categories covered all categories except for congenital malformations, deformations, and chromosomal abnormalities (17.14%), diseases of the circulatory system (16.5%), diseases of the digestive system (15.9%), diseases of the genitourinary system (15.7%), and diseases of the nervous system (14.5%). The third category comprised 8 studies that observed the incidence of cerebral infarction associated with different constitution types. The fourth category comprised 7 studies that observed the incidence of cerebral infarction associated with different constitution types in various constitution groups. The fifth category was one study that investigated the correlation between the occurrence of cerebral infarction and the type of constitution (Figure 8).
ies, 34 were associated in ≥ 3 studies, and 22 diseases were associated with QDC in ≥ 5 studies (Table 2). YADC was the most common constitution type among patients with 112 different diseases in 234 clinical studies. Of those 112 diseases, 48, 26 and 13 were associated with YADC in ≥ 2, ≥ 3 and ≥ 5 studies (Table 3), respectively.

YIDC was the most common constitution type among patients with 59 different diseases in 144 clinical studies. Twenty, 12 and 6 of those diseases were associated with YIDC in ≥ 2, ≥ 3 and ≥ 5 studies (Table 4), respectively.

PDC was the most common constitution type among patients with 78 different diseases in 256 clinical studies. Twenty-five, 20 and 14 of those diseases were associated with PDC in ≥ 2, ≥ 3 and ≥ 5 studies (Table 5), respectively.

DHC was the most common constitution type among patients with 69 different diseases in 142 clinical studies. Of those 69 diseases, 25, 13 and 6 were associated with DHC in ≥ 2, ≥ 3 and ≥ 5 studies (Table 6), respectively.

BSC was the most common constitution type among patients with 34 different diseases in 57 clinical studies. Eight, 3 and 2 of those diseases were associated with BSC in ≥ 2, ≥ 3 and ≥ 5 studies (Table 7), respectively.

QSC was the most common constitution type among patients with 60 different diseases in 133 clinical studies. Of those diseases, 21, 12 and 4 were associated with QSC in ≥ 2, ≥ 3 and ≥ 5 studies (Table 8), respectively.

ISC was the most common constitution type among patients with 10 different diseases in 20 clinical studies. Two of these diseases were associated with ISC in ≥ 3 studies (Table 9).

**DISCUSSION**

**Correlative studies on constitution and clinical disease represent a new direction of academic research in TCM**

Until recently, the perception of the TCM constitution-disease relationship was subjective among practitioners of TCM. The publication of Classification and
Determination of Constitution in TCM provided an objective, generally recognized technical tool and professional standard. Clinical research showing correlations between constitution type and disease has shown an average annual growth rate of 28.60%, which is significantly higher than the growth trends for research on TCM constitution and TCM overall for the same period. Searches of the CNKI database using the key words “constitution of Chinese medicine” and “Chinese medicine” from 2009 to 2019 revealed average annual growth rates of only 13.30% and 6.39%, respectively.

It is generally believed that government grant-funded research has higher academic value. A majority (65.02%) of the clinical research on correlation between constitution and disease that was published in journals from 2016 to 2019 reported funding. Zhu et al. found that the funding ratio of clinical studies that applied the TCM constitution scale and were published from 2006 to 2016 ranged from 48.3% to
### Table 4 Diseases for which the YIDC constitution type accounted for the highest proportion among patients (No. of studies ≥ 5)

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. of studies</th>
<th>Total sample size</th>
<th>Range of proportion (%)</th>
<th>Median of proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>23</td>
<td>14639</td>
<td>12.2-49.6</td>
<td>29.0</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>21</td>
<td>5862</td>
<td>17.8-43.7</td>
<td>26.0</td>
</tr>
<tr>
<td>Constipation</td>
<td>7</td>
<td>2504</td>
<td>22.0-59.6</td>
<td>35.1</td>
</tr>
<tr>
<td>Female climacteric states</td>
<td>6</td>
<td>1337</td>
<td>24.0-36.4</td>
<td>29.5</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>6</td>
<td>7756</td>
<td>18.3-33.8</td>
<td>24.8</td>
</tr>
<tr>
<td>Stroke</td>
<td>6</td>
<td>1380</td>
<td>23.6-34.4</td>
<td>27.0</td>
</tr>
</tbody>
</table>

Note: YIDC: Yin-deficiency constitution.

### Table 5 Diseases for which the PDC constitution type accounted for the highest proportion among patients (No. of studies ≥ 5)

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. of studies</th>
<th>Total sample size</th>
<th>Range of proportion (%)</th>
<th>Median of proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>31</td>
<td>52040</td>
<td>18.9-67.9</td>
<td>28.4</td>
</tr>
<tr>
<td>Stroke</td>
<td>27</td>
<td>6175</td>
<td>18.9-72.8</td>
<td>29.2</td>
</tr>
<tr>
<td>Fatty liver disease</td>
<td>24</td>
<td>6097</td>
<td>19.7-55.4</td>
<td>35.2</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>17</td>
<td>5127</td>
<td>14.3-53.7</td>
<td>29.8</td>
</tr>
<tr>
<td>Metabolic syndrome</td>
<td>11</td>
<td>4975</td>
<td>19.5-53.8</td>
<td>29.6</td>
</tr>
<tr>
<td>Prediabetes</td>
<td>9</td>
<td>2113</td>
<td>18.4-58.0</td>
<td>29.0</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>9</td>
<td>7633</td>
<td>18.5-27.9</td>
<td>22.0</td>
</tr>
<tr>
<td>CAHD</td>
<td>8</td>
<td>1784</td>
<td>18.1-32.8</td>
<td>23.4</td>
</tr>
<tr>
<td>PCOS</td>
<td>7</td>
<td>2050</td>
<td>18.0-65.6</td>
<td>25.8</td>
</tr>
<tr>
<td>Hyperuricemia</td>
<td>6</td>
<td>3241</td>
<td>18.7-34.3</td>
<td>27.6</td>
</tr>
<tr>
<td>Gestational diabetes mellitus</td>
<td>6</td>
<td>1428</td>
<td>23.1-40.0</td>
<td>28.2</td>
</tr>
<tr>
<td>Atherosclerosis</td>
<td>5</td>
<td>1232</td>
<td>12.3-57.1</td>
<td>23.0</td>
</tr>
<tr>
<td>Obesity/overweight</td>
<td>5</td>
<td>1399</td>
<td>18.3-67.4</td>
<td>31.5</td>
</tr>
<tr>
<td>OSAS</td>
<td>5</td>
<td>733</td>
<td>25.8-49.6</td>
<td>29.3</td>
</tr>
</tbody>
</table>

Notes: PDC: phlegm-dampness constitution; CAHD: coronary atherosclerotic heart disease; PCOS: polycystic ovary syndrome; OSAS: obstructive sleep apnea syndrome.

### Table 6 Diseases for which the DHC constitution type accounted for the highest proportion among patients (No. of studies ≥ 5)

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. of studies</th>
<th>Total sample size</th>
<th>Range of proportion (%)</th>
<th>Median of proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acne</td>
<td>20</td>
<td>7116</td>
<td>17.7-45.9</td>
<td>25.9</td>
</tr>
<tr>
<td>Chronic gastritis</td>
<td>7</td>
<td>1811</td>
<td>19.8-26.2</td>
<td>23.4</td>
</tr>
<tr>
<td>Chronic viral hepatitis B</td>
<td>7</td>
<td>1377</td>
<td>24.5-33.3</td>
<td>26.8</td>
</tr>
<tr>
<td>HPV infection</td>
<td>5</td>
<td>820</td>
<td>11.7-36.2</td>
<td>25.9</td>
</tr>
<tr>
<td>Hyperuricemia</td>
<td>5</td>
<td>3231</td>
<td>24.6-39.8</td>
<td>28.0</td>
</tr>
<tr>
<td>Hypertension</td>
<td>5</td>
<td>122924</td>
<td>8.7-46.5</td>
<td>31.1</td>
</tr>
</tbody>
</table>

Notes: DHC: damp-heat constitution; HPV: human papillomavirus.

### Table 7 Diseases for which the BSC constitution type accounted for the highest proportion among patients (No. of studies ≥4)

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. of studies</th>
<th>Total sample size</th>
<th>Range of proportion (%)</th>
<th>Median of proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAHD</td>
<td>10</td>
<td>2198</td>
<td>23.0-45.6</td>
<td>27.1</td>
</tr>
<tr>
<td>Endometriosis</td>
<td>7</td>
<td>1129</td>
<td>21.8-54.7</td>
<td>36.0</td>
</tr>
<tr>
<td>Stroke</td>
<td>4</td>
<td>1134</td>
<td>21.0-40.0</td>
<td>31.6</td>
</tr>
</tbody>
</table>

Notes: BSC: blood-stasis constitution; CAHD: coronary atherosclerotic heart disease.

### Table 8 Diseases for which the QSC constitution type accounted for the highest proportion among patients (No. of publications ≥ 5)

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. of studies</th>
<th>Total sample size</th>
<th>Range of proportion (%)</th>
<th>Median of proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperplasia of breast</td>
<td>16</td>
<td>8910</td>
<td>17.6-57.4</td>
<td>29.5</td>
</tr>
<tr>
<td>Neoplasm of breast</td>
<td>13</td>
<td>2505</td>
<td>20.0-42.0</td>
<td>31.6</td>
</tr>
<tr>
<td>Insomnia</td>
<td>11</td>
<td>2339</td>
<td>21.0-44.0</td>
<td>26.0</td>
</tr>
<tr>
<td>Depression</td>
<td>8</td>
<td>2372</td>
<td>23.5-93.3</td>
<td>44.3</td>
</tr>
</tbody>
</table>

Note: QSC: Qi-stagnation constitution.
Correlative studies on constitution and clinical disease have promoted the application of TCM in public health

Clinical studies that show correlations between constitution type and diseases can provide clinical evidence to support the participation of TCM in national public health practice. Because the 1639 studies that we analyzed involved 333 diseases and covered all categories of diseases in the ICD-10 except for one, it is clear that clinical research correlating constitution type with disease has been widely applied. The diseases that were mostly commonly studied were hypertension, diabetes, stroke, coronary atherosclerotic heart disease (CAHD), cancer and chronic obstructive pulmonary disease (COPD) — were identical to the list of chronic diseases defined by the report entitled Medium and Long Term Plan for the Prevention and Treatment of Chronic Diseases in China (2017-2025), which was issued by the State Council.25 We also found that the clinical studies involved a number of serious infectious diseases, occupational diseases and social health problems, including acquired immune deficiency syndrome (AIDS), pneumoconiosis, drug use, and Internet addiction. For example, one study found that the constitution types of 433 patients infected with HIV mainly comprised QSC, YADC and QDC, which provided a reference value for clinical treatment.26 Another study found that people with substance abuse problems and YADC, BSC or QDC types tended to relapse, which provided a basis for screening potential relapse populations from the perspective of constitution.27

Correlative studies on constitution and clinical disease have improved the internationalization of TCM constitution research

The TCM constitution theory provided a new perspective to understand individual differences in disease,28 and its application has gradually spread abroad. Increasing numbers of clinical studies are being carried out abroad and published in international journals. We identified and included 17 papers published in SCI-indexed journals considered authoritative in the field of international complementary and alternative medicine; 15 of these were published in the past 4 years, accounting for 88.24%. The widespread reach of these publications indicates that the internationalization of TCM constitution research is accelerating. There were 9 studies carried out in foreign countries. Eight of these were carried out overseas by foreign-born postgraduates trained in TCM in domestic universities, 1 of which was carried out by scholars from a Malaysia-based university. Foreign postgraduates appear to be an important force to promote the international spread and application of TCM constitution.

Disease spectrum of each constitution type and its significance in clinical prevention, diagnosis and treatment

None of the research studies included in our analysis found an association between the BC type and the occurrence of disease. Indeed, the goal of body constitution conditioning is to maintain a balanced constitution.

The proportion of the QDC type was relatively high in populations with stroke, diabetes, COPD, AIDS, hypertension and other illnesses. The disease spectrum of QDC was rather extensive. In clinical diagnosis and treatment of these diseases, it should be considered that patients may have the root of Qi deficiency. In addition to syndrome differentiation and treatment, constitution differentiation should also be considered. Applying the method of Qi invigoration to regulate patients with QDC is helpful to improve the clinical effect.

The disease spectrum of patients with the YADC type mainly involved osteoarthropathy and female genitourinary system-related diseases, such as infertility, osteoporosis, gonarthritis, dysmenorrhea and recurrent miscarriage.29 We found that YADC was common in adult women of childbearing age and older people, thus TCM practitioners should note the presence of YADC typing in such patients and consider the application of warming and nourishing Yang. Furthermore, we should take note of the opportunity to prevent diseases related to YADC, such as osteoporosis and fracture in older people.

The disease spectrum of patients with the YIDC type mainly comprised endocrine diseases, menopause-related diseases, and diseases recognized by TCM as body fluid deficiency, including hypertension, diabetes, constipation, female climacteric states, osteoporosis and stroke. YIDC was common in female, middle-aged and older people. In clinical practice, we should aim to identify patients with these diseases who are YIDC and consider the application of nourishing Yin.

The disease spectrum of patients with the PDC type mainly comprised the metabolic diseases, cardiovascular and cerebrovascular diseases, such as hypertension,

### Table 9 Diseases for which the ISC constitution type accounted for the highest proportion among patients (No. of studies ≥ 3)

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. of studies</th>
<th>Total sample size</th>
<th>Range of proportion (%)</th>
<th>Median of proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>8</td>
<td>3188</td>
<td>13.2-59.0</td>
<td>24.5</td>
</tr>
<tr>
<td>Allergic rhinitis</td>
<td>4</td>
<td>1301</td>
<td>30.0-96.7</td>
<td>40.0</td>
</tr>
</tbody>
</table>

Note: ISC: inherited-special constitution.
stroke, fatty liver disease, diabetes, dyslipidemia and CAHD, as well as obesity, gout and polycystic ovary syndrome. Health interventions based on PDC typing in these patient populations have the potential to greatly reduce the risks of multiple major chronic diseases. The disease spectrum of patients with the DHC type covered skin diseases, such as acne and eczema, hepatobiliary diseases, such as chronic viral hepatitis B, metabolic diseases, chronic gastritis and HPV infection. DHC was common in males, young and middle-aged people; therefore, such groups should be targeted for health interventions aimed at these diseases. The disease spectrum of patients with the BSC type mainly comprised circulatory system diseases, such as CAHD and stroke, and diseases involving pain, such as endometriosis. BSC was common in middle-aged and older people. We propose that extra care should be taken to prevent cardiovascular and cerebrovascular diseases in older people with BSC typing. The disease spectrum of patients with the QSC type mainly comprised diseases of the breast, such as hyperplasia and neoplasms; thyroid diseases, including thyroid nodules; and mental and nervous system disorders that are closely related to mood, including insomnia, depression, anxiety and migraine headaches. QSC was common in females and adults. Strengthening health education and intervention in people with QSC typing could contribute to reducing the risks of these diseases. The proportion of people with the ISC type was relatively high in populations with asthma and allergic rhinitis. ISC, as a special constitution type, was the common internal basis of many allergic diseases and the disease spectrum of people with this type covered various kinds of allergic disease, such as urticaria and pollen-allergy disease. Regulating allergic constitution is an effective way to simultaneously treat various allergic diseases.

Empowering future research and application of constitution-disease correlations

First, we must improve the methodological quality of studies to enhance the authenticity and reliability of the results. High-quality evaluation and reporting standards should be applied throughout the entire process to keep factors that can affect bias to a minimum. We should also consider the characteristics of each constitution in the evaluation system; examples include quality-controlled measurement of constitution, determination of multiple constitution, and the difference between tools of constitution measurement developed in different eras. Second, we should continue to promote the transformation and application of research results. The latest high-quality research results of studies on constitution-disease correlation should be included in new textbook compilations and revisions of existing textbooks and monographs on TCM constitution, as well as updates of constitution regulation guidelines. So far, the results of such studies have shown predictive value in disease occurrence and form the basis for preventive treatment of diseases, both of which will contribute to building the concept of TCM as precision medicine.68

Study limitations

There are some limitations to this study. First, as a study of the published literature, any conclusions can only be based upon summary results of selected original research articles, in which there was great heterogeneity. The results may have deviated from real-life situations. Second, owing to limitations in the selection of key words, retrieval period and databases, our literature search may not have been comprehensive. Third, because we conducted a review of the existing literature and not a clinical study, we were unable to perform any correlation analysis between a specific constitution and a specific disease.

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