

The theory development of traditional Chinese medicine constitution: a review

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Abstract Traditional Chinese medicine constitution (TCMC), as one of the most important parts of Chinese medicine theory, attracted the attention of more and more researchers and many research projects were conducted during past several decades in mainland China. This review provided a historic overview of TCMC theory and research progress in its classification, evaluation criteria and epidemiology, so as to give people through a different lens to understand human health.

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Introduction

Traditional Chinese medicine constitution (TCMC, *Ti Zhi* in Chinese) is a conception to distinguish individual differences in human physiological characteristics through the lens of Traditional Chinese medicine. The origin of TCMC theory as one of the most important parts of Chinese medicine theory can be traced back to 2000 years ago. *Yellow Emperor's Canon of Medicine*, as the earliest Chinese medical book, already provided some special terms such as *Yin* and *Yang*,

Strong and *Weak*, *Lean* and *Fat*, *High* and *Short* to classify the differences in human body characteristics. From then on, many specialists in Chinese medicine enriched and developed the theory from different viewpoints during the following dynasties. Until the late 1970s, the constitution theory was first proposed by Sheng, Wang and Kuang.^{1,2} In 1982, the first monograph of TCMC was published,³ marking the formal establishment of Traditional Chinese Medicine Constitutionology which laid the theoretical and practical basis for studying TCMC. Thereafter, TCMC as a new branch of TCM theory reflecting the directions pursued by professionals to analyze individual characteristics of human life and health, attracted more and more research attention of TCM professionals. As a result, a large number of research projects about TCMC were performed and great progress

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was achieved during the past thirty years. The purpose of this article is to comprehensively review the progress of TCMC in theoretical development, classification and large-scale epidemic survey.

Methods

Data sources

Fifteen databases were searched from their respective inception through December of 2012. Eight English databases, including Excerpta Medica Database (Embase), Pubmed/MEDLINE, The Cochrane Central Register of Controlled Trials (CENTRAL), The Cumulative Index to Nursing and Allied Health Literature (CINAHL PLUS), Global Health, Journal of Visualized Experiments (JOVE), ISI Web of Knowledge and Allied and Complementary Medicine Database (AMED), were searched with the key words of "traditional Chinese medicine constitution, TCM constitution, traditional Chinese medicine physique or TCM physique". Both traditional and simplified Chinese of *Zhong Yi Ti Zhi* were used as the search items in seven Chinese databases including China Journals Full-text Database—Medicine/Hygiene Series, China Proceedings of Conference Full-text Database, Chinese Master These Full-text Database, China Doctor Dissertations Full-text Database, Taiwan Electronic Periodical Services, Index to Taiwan Periodical Literature System, Electronic Theses and Dissertation System (Taiwan). Softcopies of all articles were obtained and read in full. Reference lists of all included studies, existing reviews, and other archives of the located publications were hand searched for further relevant studies.

Study selection

Theoretical discussion, clinical investigation and trials focusing on TCMC research were all included to summarize the development of TCMC theory, classification, and epidemic survey in this review. We adopted the following two criteria for further selection: (1) The theoretical studies must be the first ones that initiated new ideas and developed new fields in TCMC theory for the first time, other same kinds of publications with similar viewpoints published later were excluded; (2) The clinical investigations and surveys must have a certain number of participants (no less than 300 for epidemic survey) screened with definite inclusion criteria and exclusion criteria, as well as the specific research procedures, outcomes and standard for assessing the types of TCMC, rather than the simply obscure studies. If there were several reports conducted by same authors with the similar research design and procedures, the one with only the biggest sample size was included. Those investigations that participants were less than the criteria mentioned above were excluded due to their susceptibility to bias and lack of significant evidence.

Results

Our searches identified 2343 potentially relevant articles. Of these, 972 articles were excluded after reviewing their titles and abstracts because they were totally not related

to TCMC or did not focus on TCMC. All soft copies of the other 1371 articles downloaded were reviewed fully and then divided them into two categories, that is theoretical studies and epidemic surveys. Those articles that did not meet the inclusion criteria mentioned above or with similar or duplicate contents were also excluded. Finally, only 124 articles were included in this review.

Development of TCMC theory

Origins and historical evolution of TCMC theory

The theory of TCMC originated in the book of *Yellow Emperor's Canon of Medicine* which pointed out that physique difference (called *Zhi* and *Su* in Chinese) among individuals existed from their birth and would change with the age. In addition, it also created a preliminary system for sorting different physiques based on individual's complexion, stature (fat or thin), temperament (brave or cowardice), emotion-thought, age, yin-yang and Five Elements (*Wu Xing* in Chinese), systematically summarized the physiological, pathological and psychological features of each type of physique and interpreted the relationship between physique and the diseases, which laid the initial foundation for the formation and development of TCMC theory.^{4,5} To Eastern Han Dynasty, Zhongjing Zhang, one of the most outstanding specialists in the history of Chinese medicine, pointed out in his monumental work, *Treatise on Cold Damage and Miscellaneous Diseases* that individual's physique condition was closely related to the onset and the development of diseases, as a result, he advocated that treatment methods should be modified according to the patients' physique difference even for same diseases,^{6–8} leading to TCMC theory was applied in clinical practice from then on.⁹ Many TCM practitioners in later dynasties including Jin (266 AD), Sui, Tang, Song, Jin (1115 AD) and Yuan enriched the theory of TCMC, especially in the relationship between human constitution and gender, age and diseases, as well as its differentiation and adjustment. For instance, Shuhe Wang in Jin Dynasty (266 AD) pointed out that the individuals with different constitutional types presented different pulse features.¹⁰ Besides the correlation between constitution and the occurrence of diseases, Yuanfang Chao in Sui Dynasty also described the constitutional particularities of the elderly and children in his book of *Treatise on the Origins and Manifestations of Various Diseases*.¹¹ In addition, Simiao Sun in Tang Dynasty began to use constitutional theory to guide health preservation and dietary therapies.¹¹ Dongyuan Li and Danxi Zhu in Jin and Yuan Dynasties deeply elucidated the body constitutions of qi-deficiency, blood-deficiency and yin-deficiency respectively.¹⁰ During Ming and Qing Dynasties, the theory of Chinese medicine constitution got a further development. Jingyue Zhang in Ming Dynasty pointed out that people's constitutions were different and the difference could be identified from individual's consciousness, skin color and luster, temperament, stature and habits.¹⁰ The professional word of *Ti Zhi* (means body constitution) was firstly formally appeared in the book of *Case Records as a Guide to Clinical Practice* written by Tianshi Ye in Qing Dynasty, in which *Ti Zhi* was divided into six different types and the methods of classification were also clearly described.¹²

TCMC definition

The most recognized definition of traditional Chinese medicine constitution, proposed by Prof. Wang, is defined as an integrated, relatively stable and natural specialty of individual in morphosis, physiological functions as well as psychological conditions formed on the basis of innate and acquired endowments in his/her life process, and determines the susceptibility to some pathogenic factors as well as tendency towards pathogenic modes.^{13,14} They take TCMC as a harmonization between soma and spirit. However, another representative opinion proposed by Mr. Kuang argued that psychological conditions should be involved in the scope of TCMC, he considers that TCMC refers to the individuality in metabolism, function and structure, formed during individual's growth, development and aging, which usually not only determines a person's susceptibility to some pathogenic factors and tendency to pathogenic modes, but also the property, location and development of diseases, closely related to the occurrence and the prognosis of diseases.^{15,16} To date, there is still no consensus on this issue. Few Chinese medicine scholars hold that mental state should be excluded from the scope of TCMC.^{17–19} In contrast, most Chinese scholars, based on the view of the unity of body and spirit originated in the book of *Yellow Emperor's Canon of Medicine*, considered that mental state should be involved in TCMC definition.^{20–22}

Related influencing factors of TCMC formation

An accordant recognition has been achieved on the related influencing factors of TCMC formation in Chinese medicine practitioners that is constitution is mainly determined by congenital endowments containing ethnicity, inheritance and gender, which contribute to the constitutional specificity and its relative stability. Nevertheless, this relatively stable specificity is not always static and could also be transformed with individual's age increasing and the effects of various acquired factors including lifestyle, dietary habits, environment, climate, emotion, diseases and received treatments, etc.^{13,23–27} On this basis, Mr. Wang pointed out that the unbalanced status of individual's constitution could be improved through regulating the whole organism by Chinese medicines.²⁸

The relationship between TCMC and diseases

According to the theory of TCM, the insufficiency of *Zhengqi* (means healthy qi) is the basis of the occurrence of various diseases, or the primary cause leading to diseases. Many Chinese medicine scholars hold that an individual's constitution represents the level of his/her *Zhengqi* to a large extent, and thus it also reflects the power of his/her disease resistance.^{7,29–34} Generally, compared with the people with weak constitution, those with strong constitution are usually able to withstand the invasion of various pathogenic factors, and their pathogenic condition is usually relatively mild, short duration and could be easily cured even if they got the disease.^{35,36} The most important thing is that a person's constitution also could reflect whether individual's qi, blood, yin and yang as well as their functions are in a balanced condition or not. Those unbalanced constitution, with unbalanced condition between qi, blood, yin and yang, often determine individual's susceptibility to certain pathogenic factors and related diseases.^{30–32,34} For instance, peoples

with yang-deficiency constitution are apt to suffering from cold-damp evil, and those with stasis constitution easily bring about qi-stagnation and blood stasis.³⁷ Individual's constitution also impact disease's development and transformation, means that the pathogenesis evolution and the prognosis of the disease, caused by same evils/pathogens, would be different cross the individuals with different constitutional types.^{7,29,30,38} Generally, the evils invading masculine constitutions including yang-predominant or yin-deficiency will be prone to heat or dryness transformation, leading to heat or dryness pattern, and those invading feminine constitutions compromising of yang-deficiency or yin-predominant usually transform into cold or damp pattern.^{32,37} For example, dryness evil would easily transform into warm dryness when they invaded masculine constitutions, in contrast, it would transform into cool dryness if they invaded feminine constitution.²⁹ The relationship between TCMC and disease is shown as following (Fig. 1).

The relationship between TCMC and TCM pattern

As TCMC types were given the identical name to those of Chinese medicine patterns, such as yin-deficiency constitution and yin-deficiency pattern, yang-deficiency constitution and yang-deficiency pattern, qi-deficiency constitution and qi-deficiency pattern, etc., the confusion on their conception and connotation was emerged. Actually, compared with TCMC, Chinese medicine pattern, as a pathological noun, is a unique concept to understand and diagnose the diseases, which is a centralized summary of the cause, the property, the location, the tendency of a disease at a certain stage of development.^{39–41} Unlike Chinese medicine pattern focusing on explanation of pathological state, TCMC as mentioned above, focuses on reflecting the specificity of one's physiological state including physique structure, physiological functions and mental state. Therefore, although Chinese medicine

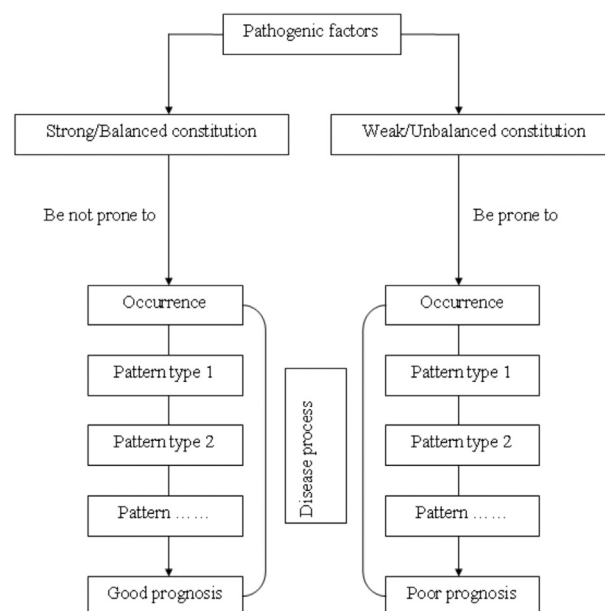


Figure 1 Relationship between traditional Chinese medicine constitution and occurrence, pattern types and prognosis of disease.

pattern is closely related to TCMC, the difference between them is also obvious.^{13,42}

The difference between TCMC and Chinese medicine pattern mainly lies in three aspects. The first one is the research contents. TCMC focuses on exploring individual's specificity of physiological state. On the contrary, Chinese medicine pattern focuses on the characteristics of disease itself at a certain stage. In other words, Chinese medicine pattern can be differentiated only in the case of illness, while TCMC could be identified regardless of the state of health.^{17,43,44} The second main difference is located in the process and factors of their formation. As we mentioned above, individual's TCMC is formed gradually under the impact of many factors including genetic background, lifestyle, environmental and social factors, among these factors the most important pacing factor is the genetic background. Otherwise, Chinese Medicine pattern is usually formed as soon as the occurrence of disease, the Chinese medicine pattern type of one disease is mainly determined by the result of the interaction between pathogenic factors and individual's healthy qi, of them pathogenic factors often play a more important role in Chinese medicine pattern formation, in most cases the pattern type to a large extent depends on the peculiarity and the severity of pathogens.^{45,46} Thirdly, their presented features are totally different. Individual's TCMC would be characterized by a relative stable state during a long-term period even up to several decades once it was formed, the process would be also slow even if the change had occurred. Otherwise, Chinese medicine pattern is formed very quickly with the occurrence of disease and disappeared when disease is cured, and usually fast transformed from one type to another during the whole process of disease.^{17,44,46} Additionally, there is also a huge gap between the quantities of their types. The types of TCMC is quite few (no more than 60), however, the types of Chinese medicine pattern is significantly more, up to over 800.^{47,48} The main difference between Chinese medicine constitution and Chinese medicine pattern is summarized as the following Table 1.

The close association between TCMC and Chinese medicine pattern is chiefly reflected in the effect of TCMC on the formation of certain Chinese medicine pattern types. It is commonly recognized in TCM community that TCMC is the basis to form certain types of pattern, which not only affect

pattern formation but also restrict its variation.^{17,44,49–54} Generally, one's pattern types when he/she is suffering from some diseases are usually closely related to his/her patterns of TCMC, which is more obvious in chronic diseases.⁴⁴ For instance, a recent clinical study on the patients with acute ischemic stroke have demonstrated that the pattern of qi-deficiency and blood stasis is more prevalent in the patients with qi-deficiency constitution type and the pattern of stirring of wind due to the deficiency of yin is more frequent in the patients with yin-deficiency constitution.⁵⁵ On the other hand, people's disease pattern characteristics could also alter their TCMC patterns in some cases if the duration and intensity of pattern's effects had gone beyond the regulatory capacity of their TCMC.⁴⁴

Classification and identification of TCMC

Constitutional classification is the basis and the core of constitutional research of Chinese medicine due to its importance in the discovery of underlying diseases and individualized diagnosis and treatment. Therefore, it is the key issue in modern constitutional research how to set up an objective and normative grouping system so that the constitutional philosophy of Chinese medicine could be successfully applied in clinical treatment and health control. Voluminous ancient literature of Chinese medicine provides a wealth of resources for selecting classification methods, but also leads to unconformity and confusion on the classification of TCMC in recent years. The first classification was proposed by Mr. Kuang in the late 1970s,² he divided TCMC into six types consisting of balanced, pale, chilly, red, sticky and static types (Table 2). In the 1980s, Mu divided it into 9 groups including qi-deficiency, blood-deficiency, phlegm-damp, blood-stasis, yin-deficiency, yin-sthenia, yang-sthenia, qi-stagnation and inherited special constitution types.²⁰ Meanwhile, a similar classification was proposed by Tian who although divided TCMC into 12 types, 9 of them is same not only on type name but also on contents with Mu's ones.⁵⁶ More TCM practitioners presented their grouping systems in the 1990s. Dai and Shi divided TCMC into 5 types according to the functional characteristics of five viscera, they are heart constitution, liver constitution, lung constitution, spleen constitution and kidney constitution.⁵⁷ Yang et al⁵⁸ also divided TCMC into 5 types with different name and contents

Table 1 Main differences between TCMC and TCM pattern.

Distinctive factors	TCMC	TCMP
Defining premise	Physiological state	Pathological state
Observed target	Human body	Disease
Examination object	Physical structure, physiological functions and mental state	Diseases' cause, property, location and tendency
Formation process	Slow	Quick
Forming factors	Genetic background social and natural environment lifestyle	Pathogenic factors Individual's healthy qi
Performance feature	Stable	Multivariate
No. of types	No more than 60	More than 800
Intervention purpose	Health preservation and disease prevention	Diseases treatment

TCMC: traditional Chinese medicine constitution; TCMP: traditional Chinese medicine pattern.

Table 2 Typical clinical manifestations of six constitutional types proposed by Mr. Kuang.

Type	Characteristics
Balanced type	Healthy facial color, good appetite, tolerance for coolness and heat, regular excretory functions, normal tongue appearance.
Pale type	Pale facial color, lack of strength, dizziness, menses pale and scant, feel numbness in hands and feet frequently, pale tongue.
Chilly type	Pale facial color, feels chills frequently, intolerance to coolness, frequent nocturnal urination, preference to hot drinks, tooth prints into tongue edges.
Red type	Flushed face, dry mouth and throat, constipation, oliguria and dark urine, less tongue coating.
Sticky type	Sallow complexion, tightness in chest and fullness in abdomen, excessive phlegm, dry throat without thirst, tongue coated with greasy fur.
Static type	Dim complexion, dark orbits, purplish lips, rough, scaly skin, fixed pain in chest, abdomen or pelvis, mass in the body, blue tongue.

which composed of yin-yang balance, yang-deficiency, yin-deficiency, qi-blood deficiency and qi-blood stagnation types. Zhao considered that TCMC should be classified balanced, qi-deficiency, blood-deficiency, yin-deficiency, yang-deficiency and blood stasis types.⁵⁹ Zhu proposed that TCMC could be classified into 9 groups including balance, qi-deficiency, yang-deficiency, blood-deficiency, yin-deficiency, qi-stagnation, yang-hot, phlegm-damp and blood stasis types.⁶⁰ He and his research team, through analyzing the data collected in their previous investigation on population constitutions using fuzzy clustering method, classified TCMC into 6 types containing strong, weak, cold, heat, damp and stasis types.⁶¹

Based on serious of discussion on extensive ancient traditional literature and comprehensive analysis of constitution studies, Prof. Qi Wang and his research team improved their previous classification that he had raised in 1995¹³ and proposed the most representative means of classification known as "the constitution rule of nine", which classifies people's constitution into 9 types: balance, yang-deficiency, yin-deficiency, phlegm-dampness, qi-deficiency, dampness-heat, blood stasis, qi stagnation constitution and inherited special constitution,⁶² the

characteristics of each constitution type are displayed in Table 3. Since this classification was formed based on sufficient previous theoretical and clinical studies, other than on the clinical experiences and academic ideas of proposers' own just like most other classifications had done, it is commonly acknowledged and accepted by a majority of TCM practitioners in mainland China nowadays. In Taiwan, a classification method commonly recognized was presented by Su and his colleagues who divided constitution into yin-deficiency, yang-deficiency, qi-deficiency, blood-deficiency, phlegm-dampness and stasis types.⁶³

Besides these means mentioned above, some classifications for typing constitutions of specific populations such as women and children were also presented during the past several decades. Chen divided female constitution into 7 types according to the features of their menses, leucorrhea, and the symptoms during their pregnancy or after childbirth.⁶⁴ Pan and his colleagues, also based on the features of menses and leucorrhea, classified the constitution of the adult women without pregnancy into balance, liver-qi stagnation, emotional fire, qi-insufficiency of spleen and kidney, yin-deficiency of liver and kidney and qi-blood deficiency types.⁶⁵ Through investigating the

Table 3 Typical clinical manifestations of nine constitution types proposed by Mr. Wang.

Type	Characteristics
Qi-deficiency	Lassitude, short breath, low voice, profuse sweat, easy to catch cold and get tired.
Yang-deficiency	Cold hands and feet, fear of cold, pale face, prefer hot food and drink, fat and tender tongue with tooth print and white coating, deep and weak pulse.
Dampness-heat	Dirty and greasy complexion, proneness to acne, foul breath, sticky stool.
Blood stasis	Dark complexion, lips and eye sockets, roughness of skin, all kinds of pain.
Qi stagnation	Depression, anxiety, doldrums, easy to insomnia, irritability, sentimentality, like to sigh.
Yin-deficiency	Tall and lean body, dry eyes, mouth, throat, skin and stool, constipation, easily suffering from insomnia, feverish sensation in the palms and soles, reddish tongue with thin or no coating.
Balance	Ruddy complexion, good sleep, energetic, regular pulse, light red tongue with thin coating.
Phlegm-dampness	Overweight with fat abdomen fatness, more phlegm and sticky sensation in mouth, slippery and fat tongue with white thick coating, tightness in the chest, laziness prone to lie down, light yellow complexion, more oil on the face, greasy and fat tongue with white coating.
Inherited special constitution	Various hereditary physical defects and allergic constitution.

$$\text{Conversion score} = \frac{\text{Original score} - \text{The number of the items of subscale}}{\text{The number of the items of subscale} \times 4} \times 100$$

Figure 2 The formula for calculating conversion score.

physiological functions of 194 young college students aged from 16 to 21 years old, Hu considered that adolescent constitution could be simply classified into coordinate, hyperactive, hypoactive and combinative types.⁶⁶ With regard to the classification of children's constitution, so far more than 10 different kinds of classification systems were presented, including the method dividing into three types,⁶⁷ four types,^{68,69} five types,^{70–73} six types,^{74,75} seven types^{76,77} and even 10 types,⁷⁸ unfortunately, of them no any two kinds of methods are exactly identical. As a result, up to now no any consensus is achieved on children's constitutional classification.

In order to measure constitution types objectively, several scales have been developed during past decade. The commonly recognized and accepted one is *TCM physical constitution scale* developed by Prof. Wang in 2006,⁷⁹ the corresponding questionnaire for clinical investigation, named *Constitution in Chinese Medicine Questionnaire* (CCMC), consists of 60 items scored on a 5-point scale, ranging from 1 (not at all) to 5 (very much). It has nine subscales which assess the types of TCM constitutions including one balance constitution and eight unbalanced constitutions (yang-deficiency, yin-deficiency, phlegm-dampness, qi-deficiency, dampness-heat, blood stasis, qi stagnation and inherited special constitutions). A total score (i.e. original score) of each subscale will be obtained by summing relevant items' scores and then convert them into one grant total (i.e. conversion score) through a standard formula shown as Fig. 2, and then the conversion score will be used to determine constitution type according to the classification criteria (Table 4). The previous study conducted by Wang and his colleagues showed that this scale has good reliability and validity.⁸⁰ The test-retest reliability (ICC) for each of the sub-scales score ranged from 0.77 to 0.90 and the internal consistency (Cronbach's α) for each of subscales was 0.72–0.82. The correlation coefficients between the nine sub-scales and SF-36 were as follows: balance constitution was positive correlation ($R = 0.546$, $P < .01$), while other unbalanced constitutional types were negative correlation ($R = -0.257$ to -0.579 , $P < .01$). For this reason and coupled with good operability, this scale was adopted by many professionals and researchers in mainland China. On April 9 of 2009, China Association of Chinese Medicine promulgated that *TCM physical constitution scale*

was the official criteria for classifying TCM constitution and determining TCM constitutional type, turning it into a uniform and standardized method to determine TCMC type.⁸¹ To date, the English version of this scale was also developed, a pilot investigation among American and Canadian Caucasians also showed that the scale had good reliability and validity.⁸² Another scale for assessing TCMC types was developed by Su and his colleagues according their classification method, the result of clinical investigation also showed it had good reliability and validity,⁶³ and it was adopted by many professionals in Taiwan. In addition, Chen et al developed a scale specially for assessing children's TCMC types mainly from three aspects including appetite and stool, sleeping and emotional state as well as complexion and physique, and preliminary investigation showed it also had good validity and reliability.⁸³

Epidemiological studies of TCMC

To investigate the distribution of TCMC types in certain population and analyze the effects of potential impact factors on TCMC types is the basic task in the clinical studies of TCMC. Since the arrival of *TCM physical constitution scale* in 2009, many epidemiological studies about TCMC were performed. Of those epidemiological investigations, that performed by Prof. Wang and his research team was not only the earliest but also the largest one, which surveyed 21 948 participants who were defined as those without severe physical and psychological diseases from 8 provinces and 1 municipality (i.e. Jiangsu, Anhui, Gansu, Qinghai, Fujian, Henan, Jilin, Jiangxi and Beijing) using a cross-sectional method and then from them randomly sampled 8448 cases who had matched age and gender with 1% of the population in 2005 national demographic census, the results demonstrated that more than two thirds Chinese general population had unbalanced constitutions, qi-deficiency, dampness-heat and yang-deficiency were the most common constitution types among them. They also found that the distribution of the TCMC types between different populations with different gender, age, marital status, occupation, educational level and residential region were significantly different.⁸⁴ From then on, many investigations focusing on investigating the distribution of general people within certain region were conducted,^{85–99} most of them investigated the subjects via convenience sampling and cross-sectional method in communities or examination centers, the sex ratios of their recruited subjects were roughly equal, their inclusion

Table 4 Balance constitution and unbalanced constitution determination standard table.

Constitutional type	Conditions	Determination results
Balance constitution	Conversion score ≥ 60	Yes
	The conversion score of each unbalanced constitutions < 30	Yes
	Conversion score ≥ 60	Basically yes
	The conversion score of each unbalanced constitutions < 40	Basically yes
	Does not meet the above conditions	No
Unbalanced constitution	Conversion score ≥ 40	Yes
	Conversion score: 30–39	Tendency to yes
	Conversion score < 30	No

criteria for recruiting subjects were also similar with those of Prof. Wang, including without no severe physical or psychological diseases, over 15 years old, local people or residents living at local for a relatively long-term period of time, and consent to investigation. There were obvious difference in the percentage of balance constitution as well as each unbalanced constitutional types cross these studies, which may be resulted from the difference in their subjects background, sample size and study region, etc., even so, some common characteristics of TCMC distribution in general Chinese population could still be found out from their results, which mainly included that the majority of Chinese general population had unbalanced constitutions, qi-deficiency, yang-deficiency, phlegm-dampness and dampness-heat were the common unbalanced constitution types among them. In addition, we also found that there was significant difference in the distribution of some certain unbalanced constitution types between the population in North China and South China, for instance, those investigations conducted in South China demonstrated that dampness-heat constitution was one of most common unbalanced constitutional types in local population, whereas those conducted in Northwest China showed that yin-deficiency constitution was one of the commonest unbalanced constitutions in local population, other than dampness-heat constitution, which is entirely consistent with TCM theory that holds there is more dampness-heat pathogen in South China and more dryness pathogen in Northwest China (Table 5).

Besides general people, the constitutional characteristics of some particular groups were also investigated (Table 6).^{82,100–112} No obvious difference was found in the distribution of TCMC types between general people and older people. Like general population, most elderly people had unbalanced constitutions and qi-deficiency, yang-deficiency and phlegm-dampness were also the most common constitution types among them. In contrast, the distribution of TCMC types in younger group presented different characteristics. First, the proportion of balance constitution was relatively high compared with old groups, especially in younger soldiers. For instance, a study found that more than half of male military pilot had balance constitution,¹¹⁰ the results from Zhou's investigation for 4300 soldiers demonstrated that the proportion of balance constitution was very high, up to 70.3%.¹¹¹ This may be related to their long-term physical exercise; Second, unlike the distribution of unbalanced constitutions in the elderly, dampness-heat constitution was common in younger population. Intriguingly, inherited special constitution is the rarest unbalanced constitution in Chinese general population, but it is more prevalent among American and Canadian Caucasian.⁸²

The factors related to the formation of TCMC were also investigated by some epidemiological studies. Prof. Wang's study investigated 2230 general peoples over 15 years old in five regions of China (Southern China, Eastern China, Northern China, Western China and Central China) and analyzed the related influencing factors of phlegm-dampness constitution via univariate analysis and multiple stepwise regression analysis, finally they found that 9 factors entered into the regression equation, which, ordered by their efficacy from strong to weak, were lifestyle-related

disease, body type, exercise habit, diastolic pressure, smoke addiction, sleeping early and get up late, greasy diet, the feeding way after born and irregular sleep.¹¹³ Yang et al evaluated the effect of lifestyle on TCMC type through investigating the TCMC types and lifestyle of 880 residents aged from 18 to 70 years old in 7 communities of Hangzhou city using CCMQ and lifestyle self-rating scale, the results showed that those, with unhealthy attitude in alcohol use, drug intake and stress control, were prone to unbalanced constitutions including yin-deficiency and dampness-heat constitutions.¹¹⁴ Through investigating 325 middle-to older-aged people in Guangzhou city, Shang found that body mass index (BMI), alcohol intake and staying up late were the main contributors to unbalanced constitutions. Specifically, a positive correlation was found between BMI and phlegm-dampness constitution, alcohol intake and phlegm-dampness/dampness-heat constitutions, staying up late and yin-deficiency, dampness-heat and blood stasis constitutions, whereas alcohol intake was negative correlated with blood-stasis constitution.¹¹⁵

Some other investigations focused on exploring the effects of some single factor on the formation of TCMC types, but the results were inconsistent. Yin's investigation suggested that overweight and obesity might contribute to the formation of qi-deficiency and phlegm-dampness constitutions,¹¹⁶ otherwise Gao's study demonstrated that there was a positive correlation between BMI and three other unbalanced constitutions including yang-deficiency, blood-stasis and qi stagnation constitutions, supporting the higher BMI as the risk factors of these three types of unbalanced constitutions.¹¹⁷ The efficacy of partiality to certain diet on the formation of unbalanced constitutions was preliminary confirmed by several investigations,^{118–120} which provides the possibility to manage unbalanced constitutions via dietary therapy. Wu, through analyzing the data of 8448 cases that had investigated by Prof. Wang in nine provinces/municipality via logistic regression method, found that some unbalanced TCMC types were associated with diet habits, tobacco and liquor intake. Specifically, phlegm-dampness constitution was mainly associated with smoking and liking eating greasy and/or baked food, and dampness-heat constitution was largely correlated with smoking and liking eating baked and/or salt food.¹¹⁸ Chen et al found that most participants with phlegm-dampness constitution were preference to savory food, most participants with yin-deficiency constitution were preference to spicy food, and those with qi stagnation constitution were preference to sweet and sour food.¹²⁰ Chen also investigated the relationship between physical exercise and TCMC, and found that less movement was mainly associated with phlegm-dampness constitution, followed by qi-deficiency constitution and yin-deficiency constitution.¹²⁰ A study for 708 airplane service staffs suggested that long-term working under noisy environment would increase the incidences of yin-deficiency, qi stagnation and blood stasis constitutions.¹²¹

Discussion

Traditional Chinese medicine constitution made obvious progress in the past several decades. The commonly

Table 5 Investigation of the distribution of TCMC types among general population.

Author. Year	Study region	Subjects			Results	
		Recruitment places	N	Age (Range, $\bar{x} \pm s$)	Balance constitution (n, %)	The commonest unbalanced TCMCs (n, %)
Wang Q, et al 2009 ⁸⁴	Mainland China	Communities, medical centers, schools and colleges	8448	15–92, 41.6 \pm 15.9	2715 (32.1)	QDC (1134, 13.4), DHC (767, 9.1), YADC (764, 9.0)
Yao X, et al 2012 ⁸⁵	South China	A medical examination center in Guangzhou	3000	18–60	403 (13.4)	QDC (612, 20.4), YADC (519, 17.3), DHC (381, 12.7)
Chen RD, et al 2009 ⁸⁶	South China	A medical examination center in Guangzhou	6525	34.7 \pm 13.2	474 (7.3)	QDC (2635, 40.4), PDC (2029, 31.1), YADC (1556, 23.9)
Wu ZD, et al 2011 ⁸⁷	South China	Communities and outpatient departments	800	15–60	218 (27.25)	DHC (187, 23.4), QDC (86, 10.6), YADC (84, 10.5)
Liang HT, et al 2009 ⁸⁸	South China	A medical examination center in Guangzhou	1186	18–60	73 (6.1)	PDC (463, 39.0), QDC (302, 25.5), DHC (152, 12.8)
Huang WB, et al 2012 ⁸⁹	South China	Communities and companies	1000	15–60	56 (5.6)	QDC (452, 45.2), PDC (385, 38.5), YADC (298, 29.8)
Lin GF, et al 2012 ⁹⁰	South China	Unknown	1112	20–60, 32.0 \pm 6.0	352 (31.7)	YADC (168, 15.1), QDC (150, 13.5), DHC (123, 11.1)
Huang ZJ, et al 2011 ⁹¹	South China	Communities and companies in Hong Kong	1023	15–89, 41.6 \pm 15.9	478 (46.8)	YADC (101, 9.8), QDC (98, 9.6), DHC (84, 8.2)
Xie S, et al 2012 ⁹²	South China	A medical examination center in Liuzhou	1238	18–80	102 (8.2)	QDC (395, 31.9), YADC (297, 24.0), PDC (234, 18.9)
Deng XM, et al 2010 ⁹³	South China	A medical examination center in Nanning	729	18–68	188 (25.8)	DHC (147, 20.2), PDC (117, 16.1), YADC (97, 13.3)
Fei P, et al 2012 ⁹⁴	East China	Communities and medical examination centers in Zhangzhou	1520	49.0 \pm 16.2	575 (37.8)	QDC (505, 33.0), YIDC (433, 28.5), YADC (300, 19.7)
Yang JQ 2011 ⁹⁵	East China	7 communities in Hangzhou	3048	15–92, 45.6 \pm 15.9	583 (19.1)	QDC (531, 17.4), YADC (381, 12.5), DHC (306, 10.0)
Xu FL, et al 2012 ⁹⁶	East China	2 communities in Shanghai	5310	50.1 \pm 17.8	1514 (28.5)	YADC (1274, 24.0), QDC (828, 15.6), QDP (384, 7.2)
Cao GL, et al 2011 ⁹⁷	North China	A community clinic in Beijing	20 026	15 or above	12848 (64.2)	YADC (5216, 26.0), QDC (4709, 23.5), YIDC (4433, 22.1)
Wan SF, et al 2012 ⁹⁸	Northwest China	One university, two hospitals and two companies in Lanzhou	3033	M: 40.44 \pm 8.13; F: 39.10 \pm 8.36	900 (29.7)	YADC (449, 14.8), PDC (440, 14.5), YIDC (349, 11.5)
Li J, et al 2009 ⁹⁹	Northwest China	Some communities and villages in Xining	516	15 or above	131 (26.6)	YADC (70, 14.2), YIDC (51, 10.4), BSC (50, 10.1)

Abbreviation: YADC: yang-deficiency constitution; YIDC: yin-deficiency constitution; QDC: qi-deficiency constitution; PDC: phlegm-dampness constitution; DHC: dampness-heat constitution; QSC: qi stagnation constitution; BSC: blood stasis constitution.

Table 6 Investigation of the distribution of TCMC types in particular population.

Author. Year	Study region	Subjects				Results	
		Inclusion criteria	Recruitment places	N	Age (Range, $x \pm s$)	Balance constitution (n, %)	The commonest unbalanced TCMCs (n, %)
Fang FF, et al 2009 ¹⁰⁰	Mainland China	Retired military officers	120 sanatoriums for retired military officers	4649	77.1 \pm 6.9	1042 (22.4)	BSC (2445, 52.6), PDC (2409, 51.8), YADC (2214, 47.6)
Huang RQ, et al 2010 ¹⁰¹	East China	Local permanent elderly residents	10 communities in Shanghai	402	45–75, 55.7 \pm 6.7	277 (68.9)	YADC (54, 13.4), QDC (52, 12.9), PDC (30, 7.5)
Xu FL, et al 2011 ¹⁰²	East China	Local permanent elderly residents	Communities in Shanghai	1042	M: 60–78, 61.8 \pm 11.3 F: 60–81, 62.1 \pm 12.0	294 (28.2)	YADC (232, 22.3), QDC (166, 15.9), BSC (82, 7.9)
Xu XL 2011 ¹⁰³	Northwest China	Local permanent elderly residents	A medical examination center in Lanzhou	303	50 or above	63 (20.8)	DHC (54, 17.8), YADC (53, 17.5), QDC (47, 15.5)
Zhang H, et al 2012 ¹⁰⁴	North China	Local permanent elderly residents	A community in Beijing	1017	60–98	229 (22.5)	PDC (212, 20.9), YADC (205, 20.2), QDC (190, 18.7)
Dong JX, et al 2010 ¹⁰⁵	East China	Local permanent elderly residents	Communities in Huzhou	350	M: 68.9 \pm 5.7 F: 64.0 \pm 9.1	173 (49.4)	QDC (49, 14.0), PDC (30, 8.6), YADC (28, 8.0)
Luo L, et al 2012 ¹⁰⁶	East China	Retired civil servants	A sanatorium for retired civil servants	570	55–93, 77.5 \pm 5.3	227 (39.8)	YADC (133, 23.3), QDC (60, 10.5), PDC (56, 9.8)
Xu YH, et al 2011 ¹⁰⁷	East China	College students	A college in Nanjing	1032	20.2 \pm 1.3	436 (42.3)	DHC (158, 15.3), QDC (115, 11.1), QSC (96, 9.3)
Li JW, et al 2011 ¹⁰⁸	South China	College students	An university in Guangzhou	324	20.4 \pm 1.6	137 (42.3)	QDC (136, 42.0), DHC (122, 37.7), YIDC (118, 36.4)
Peng YQ 2011 ¹⁰⁹	Northeast China	Female college students	An university in Shenyang	311	18–20	116 (37.3)	QDC (62, 19.9), YADC (50, 16.1), YIDC (47, 15.1)
Guo JS, et al 2012 ¹¹⁰	East China	Male military pilots	A air force aeromedicine assessment and training center in Hangzhou	924	22–53, 31.8 \pm 7.0	515 (55.7)	DHC (176, 19.0), PDC (172, 18.6), QDC (161, 17.4)
Zhou DF 2010 ¹¹¹	Mainland China	Soldiers	Military academies, units and armies	4300	18–?, 22.3 \pm 16.0	3024 (70.3)	YADC (105, 2.4), QSC (105, 2.4), QDC (98, 2.3)
Huang XJ, et al 2012 ¹¹²	East China	Male taxi drivers	Unknown	481	24–55, 36.5	247(51.4)	DHC (194, 40.3), PDC (149, 31.0), QSC(97, 20.2)
Jing HR, et al 2012 ⁸²	North China	American and Canadian Caucasian in Beijing	Several universities and two clinics in Beijing	396	15–70, 34.1 \pm 14.3	202 (50.1)	YADC (54, 13.6), QDC (38, 9.6), ISC (24, 6.1)

Abbreviation: YADC: yang-deficiency constitution; YIDC: yin-deficiency constitution; QDC: qi-deficiency constitution; PDC: phlegm-dampness constitution; DHC: dampness-heat constitution; BSC: blood stasis constitution; QSC: qi stagnation constitution; ISC: inherited special constitution.

recognition have been reached on its definition and main characteristics. Although there was no consensus on its classification and evaluation criteria, the Nine Classification proposed by Prof. Qi Wang has been accepted by most TCM practitioners and researchers, which provide a useful and convenient means to study TCMC. However, we should be aware of the possible flaws and limitation of the epidemic surveys of TCMC. For example, the sample size of most investigations were not big enough, inclusion criteria was not very clear and strictly followed, research procedures were not very standardized, thus leading to inconsistent, even contradictory results in the TCMC distributions in different studies, despite of their participants from same area or with same background. As a result, it will be necessary to continue performing multicenter clinical investigations with rigorous design and inclusion criteria in the future. It is gratifying that TCMC identification began to be used for community healthy management during past five years. The preliminary results of several studies showed that adopting TCMC identification and regulation measures in community health management could improve the effect of management and relieve the symptoms of the patients with hypertension, type 2 diabetes and metabolic syndrome.^{122–124} This indicates that TCMC identification and regulation have a wild application prospect not only in disease prevent but also in health management, it is worth further study.

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Conflicts of interest

The authors declare that they have no competing interest.

Author contributions

Youzhi Sun conceived of the design, carried out the study and drafted the manuscript. Jianping Chen was in charge of the study work, advice in the study design. Yi Zhao participated in coordination and helped to perform the manuscript writing. Steve An Xue gave expert advice in the study design and participated in manuscript writing. All authors read and approved the final manuscript.

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